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EDITORIAL ANNOUNCEMENTS

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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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Five, and twenty-eight, are the figures by which to keep in mind the length of railroad in the United States on which all trains are now protected, more or less completely, by block signals: five thousand miles (5,026.2) by automatic signals, and 28 thousand (27,791.9) by manual. On about one-fourth of the latter the signals are equipped with electro-mechanical apparatus, more or less complete, to compel the two signalmen at opposite ends of a block section to work in harmony with each other. These totals, as given in detail on another page, show increases over 1904 which are encouragingly larger than the increases exhibited a year ago:

	Miles.	Miles.
Increase in 1904—automatic, 725;	manual,	4,553
Increase in 1903—automatic, 500;	manual,	4,100

In all the foregoing figures we omit those lines (aggregating about 12,000 miles) on which the block system is employed only for passenger trains and for protection against rear collisions only. Our final total, 32,818.1 miles, is equal to about 15 per cent. of the total railroad mileage of the country. The Missouri Pacific and the Vandalia appear in the list this year for the first time. The amount of new signaling proposed for this year cannot be estimated accurately, as a number of roads express the intention of making extensions, but do not say for how many miles. The statements which do give length of line aggregate 2,766 miles of road: 443 miles automatic and 2,323 miles manual. The Pennsylvania is the only company proposing to extend manual signaling on double track lines. The roads proposing to instal automatic signals on considerable lengths of single track lines are the Atchison, Topeka & Santa Fe; the C., N. O. & T. P., and the Delaware & Hudson. The last named and the Chicago, Burlington & Quincy express the intention of establishing the block system on all their lines, though they do not mean by this that the whole of the improvement will be carried out during the present year.

The following statistics are taken from the annual report of the New York Railroad Commissioners, for the year ending June 30:

	1904.	1903.
Number of persons killed at highway grade crossings of steam railroads	105	105
Number of persons injured at highway grade crossings of steam railroads	84	73
Number of grade crossings	8,853*	8,600
Grade crossings removed during the year without expense to the state.....	1	1
Grade crossings removed, state participating in the expense	None	2
Net state appropriation for grade crossing removal...	$75,107	Nothing

*Apparent increase caused by more accurate reporting.

We have frequently called attention to the attitude, almost criminal, of ex-Governor Odell in this matter of grade crossing removal. To restate the case, briefly: the law provides that if a new railroad crosses an existing highway, the expense of avoiding a grade crossing must be borne wholly by the railroad; if a new highway is built across an existing railroad, the expense is shared equally by the railroad and the municipality, and for the removal of existing grade crossings, the railroad pays half, and the state and the municipality each pay a quarter. The present law provides for an appropriation by the Legislature of $100,000 a year, out of any moneys not otherwise expended, for this purpose, thus limiting the total annual expenditure in which the state can share to $400,000. But there is a pernicious clause which requires that any sums appropriated but not used up, in any year, must be reappropriated to make them available for use in the year following. Ex-Governor Odell not only refused to sign bills for any new appropriation in 1902 and 1903, but vetoed any reappropriation of sums held over, so that he created every possible obstruction to the removal of the inexcusably great number of grade crossings remaining a menace to highway travel and railroad travel alike, in the densely populated commonwealth of which he was chief executive. When he relinquished office, he left the state with nearly nine thousand of the grade crossings he so fondly cherished, costing about a hundred lives a year, and it must be a source of profound pride to him that, since 1902, the complete removal of only two grade crossings has been in any way chargeable to the state. The amount paid by the commonwealth for a quarter share of the expense of these two was $1,997. Meantime, Massachusetts has been able to devote $500,000 a year toward the alleviation of a condition far less serious. Governor Higgins comes into office with many legacies of his predecessor's—negligence, shall we say? But in view of its direct influence on public safety, the grade crossing question must stand high in the list. It is to be hoped that the new Governor will not be content with giving his official sanction to spending the meager annual sum now authorized, but will take steps to really get rid of all highway crossings within a reasonable period of time. The railroads and the local municipalities are exceedingly ready to stand their three-quarters of the cost; it has been the state's quarter which has kept the work back.

TESTING AIR-BRAKE HOSE.

One of the most important subjects submitted to letter ballot by the Master Car Builders' Association a few months ago was the proposed substitute for the present standard specifications for air-brake hose which were adopted as recommended practice in 1902 and advanced to standard in 1903. The present specifications were adopted after four years of committee work, although in substance they are practically the same as those suggested in 1898 by Mr. A. M. Waitt, who presented a very comprehensive report on the manufacture, testing and service qualities of hose. At the time Mr. Waitt presented his report the number of cars equipped with air-brakes was comparatively small and only a few of the railroads bought hose in large enough quantities to justify a rigid specification and test. The specifications presented then and subsequently adopted almost unchanged were substantially those of the Lake Shore and one or two other roads, and while they undoubtedly insure a high grade of hose to meet the severe tests imposed, this high grade hose costs from 15 to 30 per cent. more than a medium

grade hose, which to judge from the record of the scrap-pile would answer quite as well.

The committee on air-brake hose specifications, which presented a report at the last convention of the association, recommended a substitute set of specifications which could be met with a cheaper grade of hose but which, however, would answer all necessary and reasonable requirements in service. Inasmuch as fully 85 per cent. of all hose removed is damaged as a result of unfair usage and not because of defective material or workmanship, the substitute specifications seemed to promise some economy without seriously impairing the efficiency of the air-brake equipment, but they were rejected nevertheless and the whole matter allowed to stand for at least another year.

The three essential qualities of air-brake hose are strength, air tightness and flexibility. A hose lacking in any one of these soon fails in the severe service to which it is subjected. It must have strength enough not to expand unduly under service train pipe pressure, since rubber deteriorates rapidly under tension. It must, of course, be air-tight and moisture-proof throughout and it must be flexible and not easily kinked or broken, because when uncoupled the hose is constantly swinging from the nipple and the internal friction in a stiff hose is ruinous. Each of these qualities depends on the material used and the method of manufacture, and they are dependent largely on one another. An exceptionally strong hose will be stiff and easily kinked and a stiff hose soon opens up leaks. Any specification must cover these three points without too great insistence on any one of them.

Two-ply hose, unless it is made with strong heavy canvas layers, is lacking in strength and expands too much under pressure, while a four-ply hose or one with more wrappings is apt to be stiff and easily kinked. The more layers of rubber, of course, the less chance there is of leaks opening through all of the sheets, but the internal friction of a four or five-ply hose is very high and the rubber deteriorates rapidly. The tests generally specified in buying hose are, with the one exception of the bursting test, empirical ones intended to determine the quality of the material in the hose. The friction test and stretching test give little or no indication of the life of the hose in service. On the Burlington, which is buying hose on its own specification, it was found that the friction test had no bearing whatever on the life of the hose and that in any event a hose which showed a high friction when new, deteriorated in this respect to such an extent that before the end of a year it showed practically none. As a result this test was dropped entirely from the specifications of that road. The stretching test shows the quality of rubber in the inner tube and in the skimming sheets, and the more severe it is made, the purer rubber must be used. Pure rubber deteriorates rapidly and a large percentage of compounding ingredients must be used to make a durable grade of rubber. One large maker of brake hose is authority for the statement that it is entirely possible to compound a rubber and make up a hose which will meet the most rigid test and which will yet deteriorate so rapidly that at the end of six months it will be practically worthless.

One of the most rational tests is the one suggested in 1898 by Mr. Waitt, which was then in use on the Lake Shore. A horizontal rocker arm 12½ in. long is pivoted at its center on a post and a length of hose is attached to each end. A rod is fastened to the arm 5 in. out from the pivot, and its upper end is fastened to a crank pin with a throw of 2 in. on the end of a shaft. When the shaft is revolved the hose is given a motion almost exactly the same as that which it has when running over the road uncoupled. The internal chafing breaks down the structure of the hose and soon opens up leaks and cracks. This kinking test is easily made and is a better indication of the serviceable qualities of the hose than either of the makeshift stretching or friction tests. Another somewhat similar idea which has been proposed is to attach one end of a hose to a coupling on the circumference of a 15-in. disk and the other end to a nipple with a frictionless socket joint on the end of a pipe through which air may be supplied at any pressure. By revolving the shaft to which the disk is attached the same kinking movement is obtained, but with this device a hose can be tested under pressure as well as without pressure. If the machine is mounted in a room where the temperature can be controlled the effect of heat and cold can also be ascertained. The number of revolutions before breaking or the time under test affords a basis of comparison of the relative durability of different hose in service. Inasmuch as durability is the final consideration, regardless of material or method of manufacture, either one of the tests would be more satisfactory than the friction or stretching tests now used.

MR. MORTON AND MR. TUTTLE ON RATE REGULATION.

Among a number of recent contributions of considerable interest on the question of Federal rate regulation, there are at hand two which are particularly noteworthy. One of these is a paper printed by Mr. Paul Morton in *The Outlook*, January 14, and although Mr. Morton specifically disclaims speaking for anyone but himself, it is quite important to have this kind of personal testimony from a close adviser of the President. The other is an address recently made to a division of the Brotherhood of Locomotive Engineers by Mr. Lucius Tuttle, President of the Boston & Maine, in which a wholly new point of view is brought out and argued in a very interesting manner.

Mr. Morton says that there are few complaints of railroad rates *per se* in the United States. Rates generally are reasonable, and over 90 per cent. of the complaints made have to do with the relation of rates as between markets. There are, in his opinion, as many rates in existence in this country which may be fairly considered too low as there are rates which a court would decide to be too high, and he points out that rates which are unreasonably low may be just as disastrous to communities as rates which are too high. He favors "proper regulation of our railroads by the Federal Government," adding that with this regulation should come proper protection. If the public is to be protected against a railroad charge that is unreasonably high, the railroads (which are generally owned by the public) should be protected against a rate which is unreasonably low. Mr. Morton believes that one of three things is sure to take place in the conduct of our railroad systems.

First.—Legalization of pools—the right of the railroads to make enforceable contracts between themselves as to a division of earnings, so that they can resist the temptations of big shippers and be insured a fair share of the business moving at stable rates which shall apply alike to all patrons. This will not cure all the evils, but will go a long way in bringing about a better condition of affairs. This would protect the small shipper and the small town.

Second.—The further unification of ownership, thereby delivering in time the entire railroad ownership of the country into the hands of a few individuals or one syndicate. This condition has already been hurried and helped along by the absence of pooling, and while I am one of those who believe it would not be a calamity if all the railroads of the United States could be owned by one syndicate provided they could be managed purely and simply as a railroad proposition. I have grave doubts that this is practicable, and fear that so much concentrated power would be misused—which might result in:

Third.—Government ownership, the worst of the three "evils," if such they may be called. Governship ownership of our railroads would be the beginning of industrial and political chaos. No party in power could have such a strong political machine without in time becoming so intolerant and tyrannical as to breed ultimate revolution.

He says that he would continue the present Interstate Commerce Commission in substantially its present form. "Let it go on making investigations and findings. If it finds a rate is unreasonable, let it order such rates as it deems reasonable, and, if the railroads do not make them effective in 30 days, then let the entire matter be referred to a central court of transportation of, say, three or five members, with powers to adjudicate in all such cases except those involving constitutional questions; the findings of this court in interstate matters to be final." Mr. Morton also urges severe punishments for rebates, commissions, or any form of preferential rates, and holds that the punishment should be just as severe to the shippers, or commission agents, who seek or receive them. He advocates legalized pooling as an assurance that the small shippers securing the lowest rate and as a protection to the transportation lines against the vast tonnage and consequent temptation offered by the big shippers, which so frequently have been used to secure inside rates. He would make it impossible for others than those directly interested as shippers or commercial bodies to bring suits for action under the interstate commerce act, and he closes with the following condensed statement of the absurdity of some features of the existing laws.

The Inter-State Commerce Law as it now stands, when considered in connection with the Sherman Act, is absurdly contradictory. It provides at one and the same time for unrestricted competition and an equality of rates; for uniformity in railroad charges without agreements between the roads; for no discriminations between localities without the right of the railroads to confer as to what discriminations are. I am not sure that under the Sherman Law, as it stands, a union depot, with a joint ticket-agent selling tickets to the same point at the same rate over two different roads, is not illegal.

Mr. Morton's point of view is so sane and temperate that it may perhaps be questioned whether the clause advocating that the commission be given the power to make rates is really entirely his own, or whether it may not have been suggested by something he

has recently heard or read in his official capacity as a member of President Roosevelt's cabinet.

Mr. Tuttle, in his address to the Locomotive Engineers, started out with an analysis of American constitutional history in its relation to the present tendency toward centralization of power in the Federal Government. He showed that the power "to regulate commerce with foreign nations and among the several states and with the Indian tribes," included in the Constitution of the United States, was designed to forever prevent the erection by any state of any customs, tariffs, or other barriers, that should be an obstruction to the freest currents of commerce; and that there seemed to be no evidence that the idea of regulating the market prices or the methods of transporting either freight or passengers across state lines or to foreign countries was ever in the remotest way entertained by any of the makers of the Constitution; but that the Supreme Court since 1788 has so broadened by interpretation this meagerly stated power of Congress that it can now exercise with apparently lawful authority control over the minutest detail of interstate business. Mr. Tuttle then pointed out that for 99 years Congress had allowed this power to regulate interstate commerce to lie dormant and that during this time some nine billion dollars had been furnished by private investors without government aid, except in isolated instances and in a limited way, toward the building up of a national transportation system. Then, in 1887, "after all this investment of private capital had been made under conditions that there was no reason to suppose to be other than permanent, and after 99 years of non-interference, Congress, through the interstate commerce law, announced its power and determination to thereafter control and regulate all public service corporations that were then engaged, or might thereafter engage, in the business of interstate commerce. This special and unprecedented national legislation has now been in force for about 18 years, but it is perhaps not too much to say of it that it has in its career thus far occupied relatively more of the attention of Congress, of the law courts, of those engaged in the business of public transportation, and of the newspaper press and general public, and has caused more hypocrisy and lying, with less production of intended results, than has any other piece of national legislation that has had its birth since the foundation of our government."

Mr. Tuttle, after this historical round-up of the situation, in which he pointed out that transportation in the United States was a very old thing, while Federal regulation of it was a very new thing, then went on to his main argument of the day, addressed especially to his audience. He pointed out that rate regulation in the minds of all those who most strenuously urge it does not mean rate regulation, but rate reduction. He showed that the average return paid to the shareholders of United States railroads in 1903 was less than 3 per cent. on the par value of their holdings. Quoting a member of the Interstate Commerce Commission to the effect that unless the rate-making power was given to the Commission the people of the United States would continue to pay 40 millions a year more for their railroad facilities than they ought to, he asked where this 40 million dollars was to come from; whether it was to be taken from the present low average dividend rate or from the cost of operation. Mr. Tuttle argued that the cost of operation would certainly have to bear a good part of any such reduction; that rate reduction by the Commission would mean either wage reduction for railroad employees or dividend reduction for that portion of the public which owns the railroads; probably both of these things.

Mr. Tuttle observed the principle that where an existing proposal is criticised in debate a substitute proposal should be made, and he recommended that the Interstate Commerce Commission should have added to its present full power of investigation that of recommending to the railroads the substitution of rates that it thinks reasonable, and if within a reasonable time—say, 30 days—the railroads fail to adopt these recommended rates, the Commission should make to Congress a report of its findings and recommendation and of the failures or refusals to comply therewith, leaving to Congress the duty of applying such remedies as it may then think needful.

Mr. Tuttle's arguments supply a good answer to some of the heated statements of those who have been aptly described as professional friends of the public. It does no harm to remind people how many of the "public" are engaged, directly or indirectly, in railroad transportation; and it was a clever idea to make reference to the fact, of which there are instances constantly occurring, that abnormally low rates and low wages go hand in hand. The reader cannot help being struck, also, with the reminder that the country got along for 99 years without any Interstate Commerce Commission; but there is a certain weakness in an argument of this character. Whether it was the Interstate Commerce Commission which did it, or a more enlightened public opinion, it would be hard to say; but the undoubted fact remains that in these last 18 years the general spirit of publicity with regard to corporate affairs, and specifically railroad affairs, has been much more healthy than it was formerly. It is probable that many who share Mr. Tuttle's alarm at the extraordinary power with which the Commerce Commission now wants to be vested by Congress, will consider that the Commission has a recognized field and has done much good in the matter of publicity. Wherever there are great corporations engaged in public service, especially in transportation, there will be complaints, both just and unjust, of unfair treatment, and the very greatness of the country makes it important that these matters should have a hearing before a definitely organized body rather than be the subject of local lawsuits of an interminable character; but the prosecuting attorney must not sit in judgment on the cases he has tried!

Mr. Tuttle's alternative proposal, that cases in which the railroads should refuse to comply with the rate suggested by the Commission should be referred to Congress, does not seem a good one. There is a grave and real need that matters of this sort should be tried intelligently and tried promptly, and it is earnestly to be hoped that whatever legislation is undertaken will provide squarely for these two essentials. Any proposal to delay or confuse the settlement of rate cases will surely tend to bring out radical bills and to end in a radical law, instead of a conservative one.

Report of the Massachusetts Railroad Commission.

The advance sheets of the thirty-sixth annual report of the Massachusetts railroad comissioners give returns from only 11 railroad corporations which are engaged in actual railroad operation; and three, the Boston & Albany (New York Central, lessee), the Boston & Maine and the New Haven have operated over 96 per cent. of the railroad mileage and conducted nearly 98 per cent. of the entire passenger and freight business covered by the statistics included in the report. There is no important change to be recorded in mileage during the year. The total length of main and branch lines covered by the report of steam railroads was 2,111 miles; 2½ miles less than last year, owing to changes in location and to remeasurements.

The gross assets of the companies June 30, 1904, were $456,996,116, an increase of $24,215,267; while gross liabilities were $416,593,865, an increase of $22,316,726. A balance of $1,898,541 in favor of assets was therefore created during the year, enlarging by that amount the aggregate surplus of the companies; and the percentage of this surplus to the aggregate capital of the companies was 17.02 in 1904 as compared with 16.33 in 1903, 16.70 in 1902, and considerably smaller proportions in years previous.

The length of railroad line operated by the Massachusetts companies, both within and without the state, including roads operated under lease or contract as well as roads owned, was 4,936 miles, and this, instead of the mileage entirely within the state, is, of course, the figure which must be used in calculating debt, earnings, etc., per mile. The capital stock of these Massachusetts companies on June 30, 1904, amounted to $237,423,886, an increase of $1,589,420. This is equivalent to $48,100 per mile, as compared with a general average throughout the country in 1903 of $30,719 per mile (Poor's Manual). The funded debt of the Massachusetts companies on June 30, 1904, aggregated $152,841,358, an increase of $19,406,003, and this debt is equivalent to $30,965 per mile, as compared with a general average throughout the country in 1903 of $32,494. The total amount of dividends declared during the year ended June 30, 1904, was $14,985,815, an increase of $1,490,627 over the previous year. Thirty-one of the 44 corporations declared dividends and 13 did not. Two companies paid 12 per cent.; three, 9 per cent.; one paid 8¾; four paid 8, and the rest scaled down to the minimum of 1 per cent. paid by a single corporation.

The amount of the capital stock of the 31 dividend paying companies was $235,848,246, on which the average rate of dividends was 6.35 per cent. This is the highest average rate reported in the table of 10 year comparisons, last year's percentage of dividends to capital stock on the dividend paying roads having been 5.97, and the percentage in 1902, 6.26.

Most of the important operating statistics in the report are based on the aggregate returns of the Boston & Albany, Boston & Maine and New Haven roads, since these three companies, as previously mentioned, conducted nearly 98 per cent. of the entire passenger and freight business in the state. In 1904 these three roads earned $95,

280,348 gross, as against $93,325,932 gross in 1903, and their operating expenses were $69,145,285 as against $67,774,864, leaving net earnings some $600,000 greater than in 1903 and bringing the percentage of expenses to earnings down to 72.57, as against 72.62 last year. The general trend of this percentage during the last ten years has been upward, but the maximum rise since 1895 has only been 4.42 per cent.

Passenger traffic still continues to show good gains, although they are not as remarkable last year as in the two previous years. The total passenger mileage was 2,133 millions in 1904 as against 2,112 millions in 1903; 1,982 millions in 1902, and 1,859 millions in 1901. The total tons of freight hauled was a slightly smaller figure this year than last, but the average haul increased from 89.3 miles to 90.2 miles; so that the ton mileage showed a good increase. A table is given of the average passenger fare per mile on Massachusetts railroads for each of the last 30 years, and, according to this, the rate of 1.72 cents (excluding electric street railways) is the lowest which has ever obtained. In 1895 the average rate was 1.78 cents; in 1885 it was 1.88 cents, and in 1875, 2.30 cents. The average ton mile freight rate, however, was higher during 1904 than in several years past. As the President of the Boston & Maine put it, in a recent address in Boston to the Brotherhood of Locomotive Engineers, "to offset the advance in the general cost of living, those engaged in this company's service in 1903 insisted that material and general increases in wages were a necessity that could not longer be postponed, and general adjustments were thereupon mutually agreed upon, with a resultant total increase of payroll disbursements for the next fiscal year of over $800,000. For that same year the company fortunately received an increased average rate of $^{47}/_{100}$ of one mill a ton a mile upon its total freight movement; a sum in itself wholly insignificant and inconsequential, but which, when averaged over the year's freight tonnage, became a total of nearly $800,000, an amount almost sufficient to make good the year's wage increases." These remarks by Mr. Tuttle undoubtedly explain the occasion for the higher average rate (described by him as fortunate), which was 1.27 cents per ton mile in 1904, as against 1.23 cents in 1903, 1.39 cents in 1893, 1.72 cents in 1883, and 2.45 cents in 1875, on all the railroads of Massachusetts.

During the year 294 persons were killed on the railroads. It is well worthy of note in connection with a recent contribution on this subject in the *Railroad Gazette* that more than half of these persons (139) were trespassers. Only four were passengers. Of the total number of passengers killed, two were killed from causes beyond their own control, and two through their own fault or imprudence. An interesting table shows the ratio of passengers killed and injured by causes beyond their control to the number of passengers carried. The ratio of passengers killed without contributary negligence was one to 48,766,319 this past year. The ratio of passengers similarly injured was one to every 3,047,895 travelers.

December Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of December, printed in another column, contains accounts of 39 collisions, 15 derailments, and one other accident. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

		Killed.	Injured.
3d..	Holden Mo.	1	40
12th.	Spring Valley, O.	0	8
15th.	Bristol, Ill.	1	6
19th.	West Philadelphia, Pa.	0	3
19th.	Hinton, Ia.	2	1
22d..	Houston, Ark.	1	2
25th.	Maud, Ill.	7	12

The reports of the collision at Hinton, Iowa, indicate either that the signalman changed the derail after the freight train had almost reached it, running at high speed, or that the engineman approached too fast, the signal being all the time against him; but they do not indicate which of these explanations is the correct one. The Great Northern line lies parallel to that of the Illinois Central for a long distance approaching this crossing, and both lines are straight. The signalman was expecting a passenger train on the Illinois Central, and did not discover that the freight train was on the Great Northern track until it was near his cabin. But while the reports do not indicate to what extent this signalman disobeyed the instructions, they do indicate quite plainly that youth and inexperience were main factors in the case.

The collision near Houston, Ark., on the 22d, shows that in some places "stealing switches" still prevails on steam roads, as well as on electric; the term "smoke in" meaning, as we understand it, the attempt, on a prairie road, to reach a side track on the time of another train, the engineman acting on the notion that safely can be assured by watching the smoke from the locomotive of the opposing train. On a clear day and under favorable circumstances the trick is, of course, easy enough. Some 40 or 50 years ago this practice was common on lines within a few miles of Chicago; lines which are now wholly civilized, and in fact are classed among the most aristocratic and law-abiding in the country.

The collision near Maud, Ill., was due to a false clear signal, and the local reports agree in the statement that the signal was meddled with by a hotel runner. But the statement of the officers of the road, that the station operator "claims" this to be the case, seems to indicate doubts concerning the evidence of unauthorized interference. A newspaper man riding on the engine of the westbound train and who was badly injured, says that as his train was nearing Maud he (sitting on the engineman's side of the cab), could see the reflection of the electric headlight on the engine of the eastbound train, "but supposed that the train was standing on the siding at Maud Station. As we neared the place I could hear the puffing of the engine, but still was not alarmed. Engineer Bowen, who was on the fireman's side, said nothing, but I believe he thought the same as I—that the train was in the siding. Suddenly the headlight of train No. 1 flashed around the curve and the bright light almost blinded me, it was so close. Engineer Bowen exclaimed: 'Oh, my God! Jump, Mac! Jump!' After that I do not remember what happened." The engineman and fireman were killed.

Seven electric-car accidents were reported in the newspapers in December: Killed, 2; injured, 38.

Railroad directors as a class have never shown any marked disposition to ride on the cowcatcher (as an unfeeling public sometimes wishes them to do); but when they do thus ride they naturally mean to take the best possible measures to protect themselves. An instance of this commendable cautiousness is related by an officer of the Chicago Great Western. A tunnel of that road, east of Dubuque, has for two years been undergoing complete relining and the space available is so narrow that the scaffolds have to be built on cars, and all the material has to be kept on the cars except when it is being used; and, in addition to the limitations of room is the danger from locomotive gases. The engine of the work train never stays in the tunnel longer than is necessary to push in the cars, cut them off at the proper place, and back out. Under these conditions the officers of the road (not the directors, presumably) whenever they go in on an inspection trip take along the train staff. These men go on foot, and have no wheels and no markers; but they constitute a train, in the sense that they occupy the main track; and, to be safe, must occupy it to the exclusion of everything that might bump against them. They do not ride on the cow-catcher, but they *are* the cow catcher, so to speak—are the whole thing, in fact. This practice is mentioned as a feather in the cap of the man who invented the train staff; for what party of railroad officers would trust themselves in a narrow tunnel like this with no protection for their cow-catcher, or their hind end, except the assurance that despatchers and operators and conductors and enginemen would correctly read their time-tables, train registers, train orders and watches, and would not perpetrate the innocent forgetfulness that now and then causes a disastrous collision? Incidentally this note is a free puff also for the man who invented the electric train staff. The staff of 1860 is all right for safety; but for reasonable convenience in moving trains the automatic electric connection between the two staff stations is, of course, necessary.

Puffs aside, however, this train-staff section is an interesting example of securing the utmost safety while at the same time meeting the most difficult conditions. The rules say:

> An interlocking train staff system and signals have been erected at Winston and West Tower which will govern the movement of trains through Winston Tunnel while it is undergoing repairs, the district between these points being considered a "block." No train, engine, push car or hand car will be allowed to pass upon or through the block until they have a staff in their possession and the signals indicate "proceed." As soon as block is clear the staff must be returned to the operator. Work trains permanently employed in this block may go upon main track without train orders if they have staff in their possession and signals indicate "proceed." Staffs will be delivered by operators to engineers and must be delivered by engineers to operators. The exchange of staffs between trains is forbidden.

The men in charge say that it would have been practically impossible to do the work with reasonable facility without the staff. The tunnel, 2,400 ft. long, was originally lined with timber, and this lining was left partly in position while 36 in. brick and concrete walls were built between it and the track. The regular traffic over this line is quite heavy (25 trains each way daily) and much of the time the work train had to be kept going night and day. The staff section was 3,800 ft. long. The stations had telephone connection with each other as well as telegraphic connection with the despatcher.

NEW PUBLICATIONS.

The Strategy of Great Railroads. By Frank H. Spearman. New York: Charles Scribner's Sons. Price $1.50.

This beautifully printed book of 287 pages consists of separate articles, of magazine length, describing in outline the way in which strong men, all of them familiar names, have built up the New York Central, the Pennsylvania, the Union Pacific, the Great Northern, the Wabash, the Missouri

Pacific, the Rock Island, the Atchison, the Chicago, Milwaukee & St. Paul, and the Chicago & North Western. Each story is accompanied by a double-page map. Mr. Spearman's purpose is to produce a book of present day interest, and he has done so with decided success, most of his material which can be called history being quite recent and therefore attractive to young readers as well as older ones. He has a vigorous and attractive style, and usually gets into perfect sympathy with his subject. The book is really a dozen separate books in one, so that the reader has to take 12 different points of view. This being so, the ability of the author to quickly jump the reader and himself from one point to another is of the first importance. The fault in his sympathy is that it is too warm; so warm that, as one reviewer has said, he praises each successive "magnate" in such glowing terms that the reader assumes at once that nothing of any account can thereafter possibly be said in praise of the railroad enterprise of any other man or men. It is all right to depict as angels the really great men who by their railroad building and diplomacy have made themselves important factors in building up great commonwealths; but we had not before realized that they were such unusually perfect angels. Some of Mr. Spearman's western readers will be staggered at his glowing periods. While thus he ignores or turns off with a word every unpleasant feature of the history in hand, and makes the reader feel as pleasant as though he were perusing a fairy story, he yet sets forth the facts in quite satisfactory perspective, and to the judicious reader gives a great mass of recent or contemporaneous chronicles that are nowhere else gathered in such convenient and attractive form. The general reader will get highly interesting information, all conveyed with an assuring tone, convincing him that it was gathered from original sources. The railroad man will get less information but will be pleased to find familiar facts so finely set.

TRADE CATALOGUES.

The Little Blue Flag for January, the magazine of The Lowe Brothers Company, paint makers, Dayton, Ohio, is the convention number. The convention was the annual gathering of the company's salesmen and distributors, the magazine giving a full account, including the addresses of the President, Vice-President and others. Views from the factory are also shown, with a brief account of the life there, to make known the pleasant conditions existing. The usual interesting miscellaneous paint talk is also included.

Balanced Compound Locomotives.—The Baldwin Locomotive Works, Philadelphia, Pa., sends its "Record of Recent Construction No. 49." The contents of this pamphlet are devoted entirely to the balanced compound locomotive and a full detailed description of this type of locomotive is given, including road tests, etc. Illustrations showing the detailed construction of the steam cylinders, valves and valve gear are also shown.

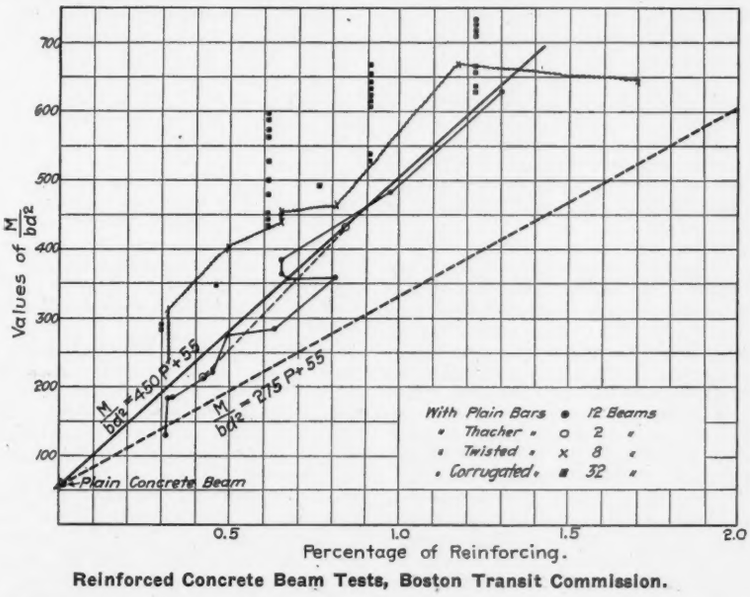
CONTRIBUTIONS

Reinforced Concrete Beam Tests.

Detroit, Jan. 21, 1905.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The record of tests of reinforced concrete beams made and reported by the Boston Transit Commission and reprinted in the *Railroad Gazette* of Jan. 20, 1905, is an important addition to the literature on this subject. Like all such tabular records, however, it is almost impossible for the reader to grasp the significance of the figures given, as different percentages of reinforcing were used as well as various forms of steel bars. The writer therefore has plotted all of the results given in the table on the diagram sent you herewith. The vertical ordinates being the strength developed, and the horizontal ordinates the percentage of reinforcing. The results obtained with plain steel bars, twisted bars, and Thacher bars have been, for each kind, connected by lines, while the small square dots are the results obtained with corrugated bars. These latter, as will be seen, gave much the greater strength, although according to the report the elastic limit was considerably greater in the case of the twisted bars than in the case of the corrugated bars.



Reinforced Concrete Beam Tests, Boston Transit Commission.

In the table given by you for these tests, you have omitted to state that for beams Nos. 43 to 78 inclusive, corrugated bars were used. The original report so states. It will be observed that these results are all considerably greater than those obtained by Prof. Talbot in his tests at the University of Illinois, due partly to stronger concrete and partly to the manner of loading the beams. The two diagonal lines on the diagram are the same reference lines as those shown on the diagrams used by the writer in his discussion of reinforced concrete beam tests before the American Society for Testing Materials in 1904.

THEODORE L. CONDRON,
M. Am. Soc. C. E.

Block Signals in the Subway.

New York, Jan. 21, 1905.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The editorial reply to my previous communication published in the *Railroad Gazette*, January 20, suggests a number of points in support of my argument for the substitution of permissive blocking in the Subway instead of the absolute block system with automatic mechanical stops. May I also be permitted to correct one or two misstatements of my position which crept into your reply? The permissive blocking proposed would reduce the distance between trains when approaching stations from 800 ft. to 20 ft. or 30 ft., and the difference in the time necessary to start from a dead stop and then come to a full stop at a station platform would be saving more than a *little* time. The average speed from start to stop in a distance of 1,600 ft. is certainly not more than 15 miles an hour so that the time consumed is fully a minute. If the following train is only 20 ft. or 30 ft. behind the train pulling out, the time consumed is less than 30 sec. Thirty seconds is not much time to lose when trains are running on 10-minute or 15-minute headway, but when a two-minute headway is attempted with the unavoidable delays in unloading passengers through two doors in each car, every second counts. There is no need of side door cars if one-half of the allowable time at stations which is wasted in pulling up to the platform can be saved in some other way. Would it not be fairer to say that the designers of the signal system, rather than your correspondent, forgot "that the real cause of delay indicates a violation of an elementary principle of block signaling, namely, that for economical operation, the block sections must be of uniform length, as measured, not in linear feet or miles, but in time consumed by trains." A system of permissive blocking as proposed is a step toward the attainment of this elementary principle rather than away from it.

As to the abandonment of an important safeguard—the automatic stop—the writer would not suggest the employment of an additional lookout and is quite ready to admit that two men in a cab would be about as unsafe a plan as could be proposed. One man can see all that is to be seen. The argument in support of the retention of the automatic stop is based on the supposition of two possible causes of accidents. Of these, the first and important one is that the motorman will fail to observe or will willfully disregard a signal indication. It is impossible to obtain from the Government accident statistics a record of the number of accidents and resulting casualties due to nonobservance or disobedience of visual signals on steam roads, but it is safe to say that it is very small. One or two bad accidents have occurred in recent years from this cause, notably the Westfield collision on the Central of New Jersey and the Park Avenue tunnel collision three years ago, but in the former it was shown that the engineer was adjusting a broken injector while passing the signal set against him. The motorman on a subway train is in a compartment

in the front of the first car, from where he has an unobstructed view. He must keep his left hand on the controller handle while the power is on and cannot well move away from his proper position in the cab. The air-brake gage, the engineer's valve and the controller are the only apparatus requiring his attention in any way and for his own comfort he will look straight ahead rather than at the rapidly moving rows of posts to one side, which is most trying to the eyes. There is no passing landscape to divert his attention from his business and no one to talk to across the boiler. The principal causes for non-observance are not present in the Subway, and as disobedience is almost sure to endanger the motorman more than any other person on the train in case of a collision, the knowledge of that fact in itself would have a most salutary effect, more so than in the case of enginemen who have some chance of escape.

The danger from physical incapacitation of the motorman, death from heart disease or apoplexy, is an exceedingly remote one. For 25 years the Manhattan Elevated has made an average of more than 20,000 train miles a day without any such occurrence, at least to the writer's knowledge. In any event the master controller handle is provided with a shut-off spring for the very purpose of cutting off the current if such an accident did happen. If desired, it would be a very simple matter to attach a device to the controller and connected with the air-brake system which would apply the brakes at the same time that the controller handle was suddenly released.

The writer fully realizes how impossible it would be to apply any such a remedy as he proposes to the Subway signal system at this or any future time. The Rapid Transit Commission and the Interborough Company are committed to the use of all the so-called safety appliances which have been put in and neither one would dare to take any of them out because of the great responsibilities assumed in case an accident did happen and an investigation showed that the device in question was not in working order. Neither would it be wise to take out the automatic stops at the signals controlling the movement of trains into stations only and retaining them at all other signals, which would be a partial compromise. Such a diversified signal system would only be confusing and dangerous. But experience can only be gained by mistakes and any future lines which may be built for such dense traffic should take a lesson from the Subway.

R. A. D.

Making Use of Railway Congress Bulletins.

Boston, Mass., Jan. 23, 1905.

To the Editor of the Railroad Gazette:

In your issue of January 19 I noted an interesting editorial calling attention to the desirability of united action in the matter of rail specifications and testing. The articles by Messrs. Dudley and Van Bogaert referred to in the editorial are thoroughly scientific and their conclusions have been proved to be true by experimental research. The results of these studies should certainly be widely disseminated by the International Railway Congress as suggested by the editorial.

This suggests the thought that the very valuable compilations of the Railway Congress would produce much more valuable results than they do now, if the central authority of each railroad to whom the monthly bulletins of the Congress are sent, would distribute them to the heads of departments most interested in the particular features of railroad work brought out in each number. As large systems are handled at present, the men directly interested in the details of locomotives, for instance, cannot afford time to read discussions about cars, signals, rails, ties, buildings, bridges, operating rules and the hundreds of other features that are discussed by the reporters of the Congress and printed in its bulletins. Each feature so discussed is, however, full of interest to some one or more of the men employed on each road and a very little attention on the part of the proper official would greatly increase the value of the work of the Congress. Under existing conditions, on some roads at least, the bulletins are filed away and are not read by those who are most interested; and the work of the compiler goes for naught, as will that of Mr. Dudley on the relation of wheels to rails unless some such action as that urged by your editorial is taken.

J. P. SNOW,
Bridge Engineer, B. & M. R. R.

Experiments by the Master Mechanics' Association.

New York, Jan. 25, 1905.

To the Editor of the Railroad Gazette:

My attention has been called to an editorial in the *Railway Age* of Jan. 13, 1903, in which the Master Mechanics' Association is designated as being "too poor and indisposed to make experiments which cost money and require vigorous and enthusiastic initiative." I was greatly surprised to see that statement and am at a loss to understand the motives which prompted it. The writer of it is either grossly ignorant of the objects, aims, and work of the association, or else is willfully airing a personal "grudge." As a matter of fact the Association has either directly or indirectly appropriated at various times considerable sums of money to further technical investigation. It is unnecessary to enumerate the work of the organization, as all railroad men are familiar with it.

The Master Mechanics' Association is not a rich organization but its members are wide awake and not "indisposed" to spend money for the purpose of solving important problems connected with locomotive design, operation, etc. Permit me to say, however, that as an individual member, I would do my utmost to prevent the association from spending money for building models to investigate the subject of locomotive counterbalancing as is suggested in the aforementioned editorial. I do not question that locomotives are not properly counterbalanced nor do I believe that the present rule of the association is good. Modern designers realize that every type of engine must be counterbalanced differently. The problem is, however, one of pure mechanics and can be approached in every case by careful mathematical calculation. When the magnitude of the disturbing forces has been determined, it is then only necessary to effect a compromise between horizontal and vertical balancing and proportion the counterbalance weights accordingly. I cannot see wherein models will help to solve the question.

M. M.

Wheel-Carrying Angle Bars.

Nice, Jan. 12, 1905.

To the Editor of the Railroad Gazette:

In the report published in the "Bulletin of the International Railway Congress" (November, 1904) Mr. van Bogaert, on page 1,394, refers to Mr. Ast's views, criticised in my letter to the *Railroad Gazette*, Sept. 28, 1901, and says further in regard to the wheel-carrying angle bars: "We *think* that the improvement they (Saxony and Bavarian railroads) have observed in this joint is simply due to the increased section and moment of resistance of the outside fish plate." Referring to my letter published in the *Railroad Gazette* Jan. 29, 1904, I beg to say that the sections used in Saxony and Bavaria weigh 90.5 and 92.5 lbs. per yard, width of head 2.56 in. and 2.59 in. The section used on the Prussian test track (Berlin-Zossen) weighs 82.5 lbs. per yard width of head 2.83 in.; this excessive width being the *only* reason for the unfavorable results therewith. By means of comparing the observations gained with the Barschall joint on the test tracks of the P. R. R. Eastern Division, and Lines West of Pittsburg, with the observations mentioned in the *Railroad Gazette* of Dec. 16, 1904, page 645, it will be ascertained that the most unfavorable observations are those referring to the 100-lb. rail, while the most favorable ones *ever gained with any joint*, referred to the 78-lb. rail (total width of bearing surface at the joint 3⅛ in.). Hence the efficiency of wheel-carrying joints does by no means depend on the weight of the main rail but simply on the width of the bearing surface at the joint.

MAX BARSCHALL.

Developments in Electric Traction.*

The ultimate profits to be derived from any new traction scheme, whether steam or electric, must, of necessity, depend upon the resulting effect on traffic. This is, in many cases, a more or less unknown quantity when the proposition of electrification is first considered; but both history and experience have proved that in the past, the amount of traffic has increased approximately in proportion to the facilities given the public and that it is quite possible to create a new traffic, as well as to provide for that already existing. It is the function of the railroad not only to deal with the business community that travels from necessity, but to give the greater comforts and facilities, which will induce people to patronize their lines, who would either stay at home or travel by other means, if no such improved conditions existed.

For this reason, in considering the electrification of a steam system as a whole, or the electrification of its branch or suburban lines, it is not sufficient to obtain figures showing the likely profits to be derived from such an undertaking merely by compiling data showing the cost of installation and the traffic receipts based upon the number of passengers traveling at that time. A margin may be allowed in favor of electrification due to the extra traffic that the increased facilities are practically sure to induce. The most profitable method of handling a distributed passenger service is by running many short or long trains as the case may be, at frequent intervals, whereas with steam locomotives it is the general practice to deal with the traffic with only long trains capable of conveying a very large number of people at one time. This fact shows very forcibly that in a great number of instances where the traffic is of a concentrated nature at the present time, and, therefore, considered as unfitted for being handled electrically, were an electric system installed, the traffic would naturally change from the concentrated to the distributed form.

A great deal has been written concernfng the possibilities of single-phase traction, and, as is often the case with the development of a new principle, many appear to have formed too optimisitic ideas of its capa-

*Extracts from a paper by Mr. W. B. Potter, chief of the railway department of the General Electric Company, read at the January meeting of the New York Railroad Club.

bilities. While we recognize the advantage of such a system in many cases, it is a mistake to imagine that it will be a cure for all ills and revolutionize the railroad world. It is well, therefore, to have a clearer idea of the advantages and disadvantages of single-phase traction and also to analyze the reasons governing the choice of such a system. It is self-evident that the relative expenditure for equipment, operation and maintenance, should be the fundamental reason governing the selection of a system for any particular service.

The single-phase A. C. system possesses two features which recommend its use; economy of trolley copper, due to the higher trolley voltages, and the elimination of the rotary converter. The chief advantage gained by these features is a saving in the initial cost of equipment: factors which increase in importance in proportion to the amount of power required by each car or train and with the length of the trolley line. On the other hand, the A. C. car equipments cost more than the D. C. equipment; for a similar service and the same given rise in temperature of the motors. It is, therefore, apparent that the relative cost of an A. C. or D. C. system will be materially affected by the number of cars employed. The saving in power resulting from the elimination of the rotaries is about off-set by the greater weight and slightly lower efficiency of the A. C. motor. The efficiency of the A. C. control, during acceleration, will, generally speaking, be somewhat higher than that of the D. C. system with series-parallel control. With the A. C. system fractional voltages can be obtained from the transformer on the car. Each step of the A. C. controller gives a running position which corresponds with the series and parallel positions in a D. C. controller.

The potential of the transmission lines from the power station may be selected, as in the case of the D. C. system, without reference to the trolley or secondary voltage. The trolley voltage must, however, be considered on a different basis than that of the D. C. system, for the reason that in addition to the ohmic resistance of the trolley and track circuit, there is an apparent increase in resistance, due to the alternating current. This increase in apparent resistance for 25 cycle alternating current, as compared to direct current, is about 50 per cent. in the trolley wire and between six and seven times greater in the return rail. The rails being steel, the increase in apparent resistance is relatively much greater than in the trolley wire. As the resistance of the track return with large steel rails is proportionately much less than that of the trolley wire, the apparent increase in resistance for the latter and the track taken together will be, roughly, from one-half to twice that for direct current. An alternating current at 1,000 volts, is, therefore, about equivalent to 600 volts direct current so far as affecting the amount of trolley copper; and to secure the advantages of the A. C. system to a reasonable degree at least 3,000 volts or, for heavier service, perhaps 5,000 volts must be employed.

The design of an A. C. motor as regards length of air gap and armature speed is affected by the lower average flux density. For this reason an A. C. motor is larger and heavier than a D. C. unit of the same output. The commercial A. C. motor represents a compromise in which the armature speed is somewhat higher and the air gap slightly less than would be the case in a D. C. motor of corresponding capacity. The maintenance of an A. C. motor will, in all probability, be greater than that of an equivalent D. C. motor, due both to the higher armature speed and the smaller air gap.

The equipment of heavy locomotives with A. C. motors for high speed passenger service is a possibility, but owing to the limitations imposed by the space available for the motors, it seems probable that two locomotives, each with four motors, would be required for a service which could be performed by a single D. C. locomotive with four gearless motors. For locomotives in slow speed work—such as freight or shifting, a double gear reduction will, in many cases, be required, owing to the difficulty of winding an A. C. motor of large size for slow speeds. In view of the extensive application of the D. C. system, it is fortunate that the A. C. motor and its control may be so arranged as to be well adapted for operation on either high potential alternating or 600 volt direct current lines. This adaptability is an important factor in the net earnings as the equipments are not necessarily limited at all times to a particular route and further, where D. C. trolley lines are available, the expense of installing a special A. C. trolley is saved.

The above comparisons relating to A. C. and D. C. systems indicate certain financial and technical differences which have to be met. There is no question as to the successful operation of A. C. apparatus and the advisability of its use when such an installation will prove financially advantageous.

The power required per ton mile for moving trains varies so greatly with conditions of traffic that any direct comparisons between electricity and steam as a motive power can only be made by assuming a given class of service. The suburban type of traffic is generally recognized as being more especially suited to electrification and a comparison in such service of the steam locomotive and an electrically-equipped train of equal seating capacity, will be of interest.

It is admitted that the first cost of equipping a railroad electrically is higher than the initial outlay for equipping the same road with steam locomotives; but it is wellnigh impossible to make a general comparative statement as to the relative first cost. This will depend on the number of locomotives required to handle the traffic in the one case and in the other upon the density of the traffic, and it is the latter factor upon which the size of the generating station and transmission lines are dependent.

For example, assume a suburban train of four cars hauled by a steam locomotive, and a similar train operated by electric motors under the cars:

Weight of steam locomotive	110 tons.
4 cars, 40 tons each	160 "
Total weight of steam train	270 tons.

The electric equipment for these four cars to perform the same service would weigh, approximately, 50 tons.

Electric equipment	50 tons.
4 cars, 40 tons each	160 "
Total weight of electric train	210 tons.

Tests on a steam locomotive in this class of service have shown, approximately, .07 i.h.p. hours per ton-mile and a coal consumption of 6.86 lbs. per i.h.p. hour, charging up the full amount of coal used during the 24 hours, whether running or idle. On the above basis, assuming coal at $2.50 per ton, we have the following as cost of coal per train mile:

I.h.p.-hrs. per ton-mile	0.07
I.h.p.-hrs. per train-mile	18.9
Pounds coal per i.h.p.-hr.	6.86
Pounds coal per train-mile	130.0
Cost of coal per train-mile, cents	14.5

The cost of electric power per k.w. hour is well established by records from many power stations. The following is a typical record from a station in railroad service:

Coal ($2.85 per ton)	$0.00286
Water	.00036
Labor	.00158
Supplies	.00011
Maintenance	.00009
Total	$0.00500

As the cost of coal and labor is a variable quantity we will assume $.006 as a basis. The labor and maintenance of substations may be taken as 10 per cent. additional, making a total cost per k.w. hour of $.0066. The efficiency of transmission and substations may be taken at 78 per cent. The cost of power for the electric train would, therefore, be as follows:

Weight of train	210 tons.
Watt-hrs. per ton-mile (equivalent to above .07 i.h.p.-hrs.)	58
Kw-hrs. per train-mile at train	12.2
Kw.-hrs. per train-mile at power station	15.6
Power per kw.-hr. at train	$0.0066
Cost of power per train-mile	10.3 c.

The wages per day for a train crew in steam service may be taken as follows:

Engineer	$3.50
Conductor	3.00
Fireman	2.00
Two train hands	3.50
Total	$12.00

The crew for the electric train will be the same, omitting the fireman. In steam service this crew will make a train mileage of, approximately, 100 miles per day. In an electric service, due to its greater flexibility, it is a reasonable assumption that the crew will make a mileage of 150 miles per day.

Under this assumption the wages per train-mile will be:

Steam	12 cents.
Electric	6.7 "

The maintenance of steam locomotives varies, but in this class of service 6.5 cents per locomotive-mile seems a fair basis from the records available. The maintenance of the electrical equipment per car-mile on the Manhattan is $.25 and as these equipments are larger, we will assume one cent per car or four cents per train-mile.

A summary of the comparative cost per train-mile is as follows:

	Steam.	Electric.
Coal or equivalent elec. power	14.5 cts.	10.3 cts.
Water	0.5 "	.. "
Train crew	12.0 "	6.7 "
Maintenance	6.5 "	4.0 "
Supplies	0.5 "	0.2 "
Total	34.0 cts.	21.2 cts.

Assuming a yearly mileage of 50,000 miles, which is a reasonable assumption for the electric train, the yearly difference in cost of operation, in favor of electricity, would amount to $6,400, representing an interest on the total investment per train which would be more than sufficient for that usually required for the car equipment and the proportionate part of the power station and transmission. Furthermore, to this capitalized investment should be credited the cost of a steam locomotive equipment capable of making 50,000 miles per year.

As this is a brief consideration of a general example, it is hardly worth while to enter into refinement, but in nearly every case the use of electric power will make it possible to secure many incidental economies, both in utilization of rolling stock and cost of operation, the aggregate of which may be a large item.

The following comparison from statistics covering the steam and electric operation of the Manhattan Elevated shows the increase in traffic and the lower cost of operation per car-mile, resulting from electrical equipment. The probable increase in traffic was not sufficiently recognized, prior to the electrical equipment, to be reckoned an important factor in the earnings of the road, but its influence to this end will be better appreciated when it is remembered that during the latter period of steam service the number of passengers carried decreased each year.

	Steam.	Electric.
Date	1896.	1904.
Operating ratio	58.1%	41.2%
Passengers carried	185,138,000	286,634,000
Car mileage	43,241,000	61,743,000
Receipts per car-mile	21.6 cts.	22.95 cts.
Operating expenses:		
Total, per car-mile	13.2 "	9.5 "
Total, per passenger	2.92 "	2.04 "

Careful calculations should be made on each individual road considering electrifica-

tion, as actual results will vary with every new set of conditions. The point at issue is whether the traffic is, or is likely to be, of such a character that the saving in operation or increased receipts will show a proper return upon the required capital.

In considering the application of electric power to freight service, the subject may be considered more strictly from the standpoint of existing traffic, as the reasons which influence the growth of passenger traffic will apply, only in so far as the movement of freight may be facilitated and cheapened. Electric power in a single unit, such as a locomotive, is best suited for general freight, although there may be special cases where it will be advantageous to equip several or all of the cars in a train and control from the leading car.

The following table has been prepared as an illustration of the use of electric locomotives. Three typical freight roads have been selected, the cost of steam locomotives being taken from the actual records, so far as obtainable. The costs of electric operation are derived from the records of existing electric locomotives, and from a study of the service conditions to which they would be subjected in each particular case. Details of the present operating expenses with steam and the estimated cost of operation of an electrical installation to duplicate the present service are given in parallel columns.

	Operation of					
	Road A.		Road B.		Road C.	
	Steam.	Electric.	Steam.	Electric.	Steam.	Electric.
Length of road	15.4	15.4	34.5	34.5	113	113
Character of service	Pusher.	Pusher.	Gen. frt.	Gen. frt.	Ore.	Ore.
Trains: Daily, number—total	20	20	...	...	44	44
Average number of cars	40-60	40.60	8-20	8-20	30.4	30.4
Average weight trailing load	275-600	275-600	240-690	240-690	2070-547	2070-547
Locomotives: Weight, total	145	85	130	90	130	80
Weight on drivers	86	85	70	90	80	80
Number, total	23	12	43	27	35	20
Number in daily service	18.8	10	39	24	30	18
Daily mileage, regular	455	455	1,150	1,150	5,000	5,000
Daily mileage, switching	560	560	450	450	...	...
Daily mileage per locomotive	54.4	102	41	67	160	278
Cost of coal per ton	$1.26	$1.26	$1.87	$1.87	$3.25	$3.25
Daily number 1,000 ton-miles, gross	288	261	1,109	1,047	7,155	6,896
Operating expense per engine-mile:						
Fuel	$0.0852	.....	$0.1620	.....	$0.1665	.....
Power	.....	$0.0422	.....	$0.1400	.....	$0.0903
Engine crew	.1058	.0651	.1310	.0488	.0620	.0398
Maintenance and repair	.0883	.0243	.1010	.0258	.0524	.0250
Roundhouse and inspection	.0168	.....	.0339	.....	.0090	.....
Oil, waste and supplies	.0084	.0014	.0092	.0020	.0038	.0020
Total	.3045	.1330	.4371	.2166	.2937	.1571
Depreciation	.0518	.0500	.0680	.1265	.0293	.0453
Total per engine-mile	.3563	.1830	.5051	.3431	.3230	.2024
Operating expense per 1,000 ton-miles:						
Fuel	.3030	.....	.2340	.....	.1165	.....
Power	.....	.1640	.....	.2150	.....	.0655
Engine crew	.3770	.2530	.1895	.0747	.0434	.0285
Maintenance and repair	.3140	.0945	.1460	.0396	.0367	.0181
Roundhouse and inspection	.0599	.....	.0477	.....	.0063	.....
Oil, waste and supplies	.0295	.0055	.0133	.0052	.0026	.0015
Total	1.0834	.5170	.6305	.0045	.2055	.1136
Depreciation	.1820	.1950	.0985	.1940	.0205	.0328
Total per 1,000 ton-miles	1.1654	.7120	.7290	.5285	.2260	.1464

In the above table, Road "A" uses locomotives for pushers over a heavy grade, and the second column shows the estimated economy which could be obtained by substituting electric locomotives for steam over the short section on which these pushers are operated. Road "B" handles general freight over a section in which a large part of the traffic originates, where the service demands a great proportion of switching and short runs. Road "C" hauls ore over a section with heavy loads in one direction and empty trains in the other.

These results further emphasize that every case demands an intimate study of itself. For example, considering the cost of depreciation per engine mile, under road "A" the cost of depreciation with steam operation is $.0518 per engine mile, while with electrical operation it is estimated at $.05 per engine mile. In the other two cases the cost of depreciation with electric operation is greater than with steam, the reason for this being that on road "A," due to the excessively severe service, the life of steam locomotives is short and their repair and maintenance account very high. At the same time, being a short line, the cost of electric equipment is relatively low. In the other cases the lines are more extensive and the cost of electric equipment is greater proportionally than in the case of road "A."

The method of conveying electric power to a car or train is influenced by the size of equipment and conditions under which it operates. The simple trolley and wheel in general use has been surprisingly satisfactory in service much more severe than that for which the trolley wheel was originally considered. The limitation of its capacity is rather in the life of the wheel than from any particular difficulty in collecting the current. With cars of medium size, at moderate speed, an upward pressure of 15 or 20 lbs. against the trolley wire is sufficient and the life of the wheel is frequently 10,000 miles or over. At car speeds of 50 to 60 miles an hour an upward pressure of 35 to 40 lbs. is necessary to insure the wheel maintaining close contact with the wire over the irregularities of the suspension. This greater pressure, coupled with the larger amount of current commonly taken at such speeds, results in the rapid wearing of the trolley wheels, which is more especially noticeable on account of the large daily car mileage, common to high speed service.

Considerable attention is being given to the development of a collector for heavy service which will cost less to maintain than the present trolley wheel. The bow form of trolley, in which a sliding bar of copper or aluminum at right angles to the trolley wire replaces the trolley wheel, has been used to some extent abroad and seems to have met with considerable favor. The cars on which the bow trolley has generally been used are of comparatively slow speed and power, and such tests as have been made indicate that in the equivalent of our suburban service the maintenance of the bow trolley would considerably exceed that of the trolley wheel. A modification of the bow trolley in which a roller replaces the sliding bar has been used in a number of cases, with excellent results. Where the trolley wire is maintained within a foot or two of uniform height, a reversible trolley contact with a pantagraph mechanism, carrying a roller for contact with the wire, can readily be applied. Where the variation in height of the trolley wire is considerable, on different parts of the same line, the pantagraph construction must necessarily be of considerable size. The first electrical equipment of the Brooklyn Bridge was provided with this pantagraph form of trolley prior to the installation of the third rail. It is customary to install two pantagraph trolleys, each collecting its share of the current and where necessary to collect a large amount, as might be the case in locomotive work, additional trolley contacts may be installed to any extent required. A pantagraph type of trolley, provided with a shoe, instead of a roller, is well adapted for use in connection with third rail operation, where it is desired to make contact through special track work or road crossings where the third rail cannot be conveniently installed.

The ordinary methods of trolley wire suspension and insulation are not well adapted for high potential alternating trolley lines, and what is known as a catenary suspension of the trolley wire will probably be more generally used. In the catenary suspension the supporting cable or catenary is carried over the top of high potential insulators at the point of support and the trolley wire is attached by clips and hangers, directly to the catenary cable without intervening insulation. The catenary cable thus serves as a supplemental conductor to the trolley wire and it may be of either steel or copper. As the trolley wire is supported at frequent intervals, the poles for the catenary can be spaced at longer distances than common with the ordinary type of trolley construction. While especially advantageous for high potential work, there is no reason why the catenary form of suspension should not be more generally employed for direct current work and it provides a means for supporting a larger trolley wire, if desired, than is now commonly used. The third rail, although used to a considerable extent in place of the trolley, has been criticised, particularly from the standpoint of danger and trouble from sleet. The unprotected rail is open to both these objections, but with a suitable protection against accidental contact and from sleet, these objections are to a great extent overcome.

The initial expense of electrical equipment, more especially that due to the cost of power station and trolley line, has deterred many steam railroads from electrifying branch lines in sparsely populated districts. Such lines could be served more profitably by independent cars than by steam trains, as the possibility of economically operating single cars on frequent headway, by providing a better service, would have an important influence upon the development of the traffic.

To meet the requirements of this class of service, a self-propelled car, independent of any feeder system, seems particularly well suited. The principal difficulty that has been experienced with this type of equipment is the insufficient capacity of the engine; and this is not surprising when we appreciate that the motors of a 40-ton electric car under ordinary service conditions are frequently required to develop 500 h.p. during acceleration. The building of a successful car of this description is a problem depending entirely upon the engine; and there seems reasonable ground for the belief that an engine well adapted to this class of work can be produced.

The General Electric Company has under construction a gasolene-electric car which, if successful, should be well adapted to meet the requirements of the class of service under consideration. This car is provided with passenger, smoking, toilet and baggage compartments and is 65 ft. long over all. The engine-room is at one end and a motorman's compartment is provided at each end of the car, to permit it being operated in both directions. The car complete will weigh, approximately, 55 tons. Fig. 1 shows a plan and elevation of the car body. This draw-

ing is partially in section to show the arrangement of engine and generator.

The engine is a six-cylinder Mercedes automobile engine and will have a full load output of 200 brake h.p. and will run at 600 revolutions. It will be direct-connected to a 600-volt generator, the fields of which will be separately excited from an exciter driven by the engine. The controller for the motors will be provided with a series-parallel switch, but no starting resistance, in the usual sense, will be required, as the speed of the motors will be regulated by controlling the voltage of the generator through field resistance points in the controller. The water-cooling system for the engine will be carried through radiators on the top of the car during the summer, and in the winter through the ordinary heater pipes for the purpose of warming the car. An engine of the size proposed will provide for an acceleration sufficient to maintain a schedule speed of 20 to 25 miles where stops are three to four miles apart and the car can be easily maintained at a running speed of 40 miles. There is no data on which we can accurately base the operating cost of such an equipment, but it seems probable that including all expenses—of the motorman, conductor, fuel and maintenance—the cost will be between 15 to 20 cents per car mile. This will depend somewhat on the daily mileage made by the conductor and motorman, as their wages amount to a considerable portion of the total expense. Reference has been made to this type of equipment, because considerable interest appears to exist regarding the possibilities in this direction, but what measure of success will be attained can only be determined by a thorough trial. Several different types of engines are under consideration, as is also the use of kerosene as a fuel. The object in view is to produce an equipment comparable in some respects to the all-electric car, and at the same time cheaper to operate than the steam trains, which are usually run over the lines for which an equipment of this type is intended.

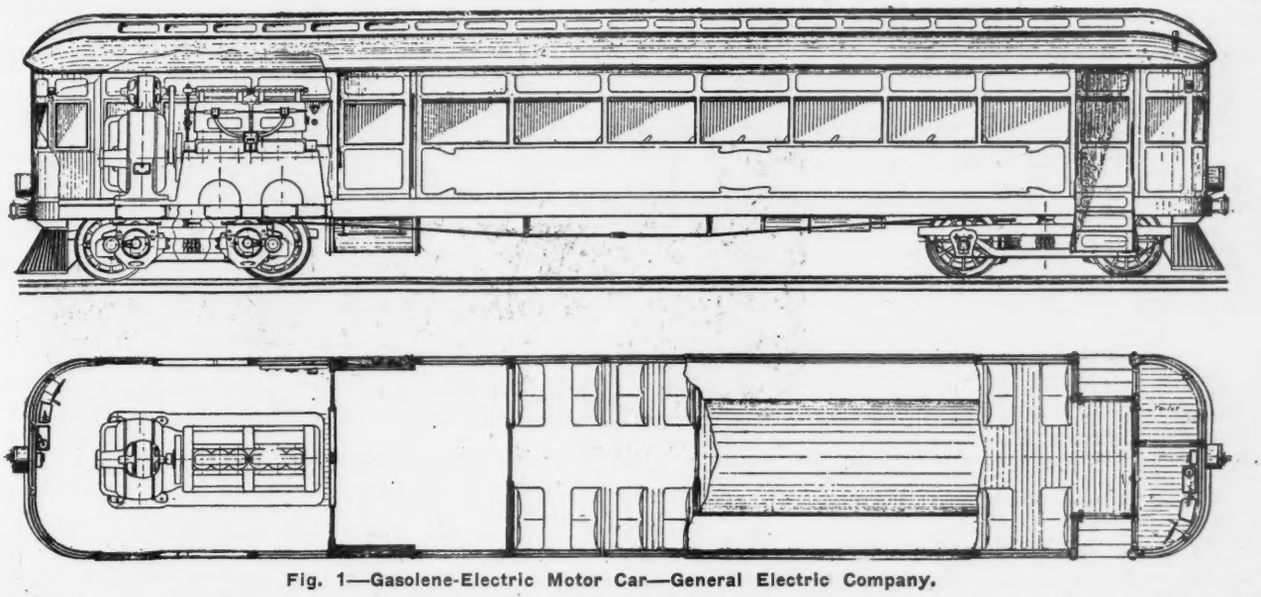


Fig. 1—Gasolene-Electric Motor Car—General Electric Company.

The discussion which followed the reading of the paper was devoted to the broader considerations of electrification of steam roads. Mr. W. J. Wilgus, Fifth Vice-President of the New York Central, in charge of the company's terminal improvements, said that while the actual cost of changing a line over to electric operation including the power house, transmission line and rolling stock was only a small part of the total expense which must be incurred in making such a change; on the other hand the benefits to be derived from such a change were more than as measured by the reduction in operating expenses brought about. In the case of the New York Central, which, of course, represents an unusual condition, the expense of installing all electric equipment will be only about one-quarter of the total expenditure which will be made within a radius of 30 miles from the Grand Central Station. The density and varied nature of the traffic will require a separation of local and express trains both through and suburban requiring four and eight tracks where there are now only two and four tracks. All grade crossings must be abolished for safety, and this of itself will cost a large sum. Again all suburban station platforms must be rebuilt because it has been decided to have the platforms on a level with the car floors. In addition to these changes there is, of course, the entire rebuilding of the Grand Central Station and adjacent yard. But, on the other hand, the change from steam to electricity will permit of greatly improved train service, does away with the objectionable features of travel, smoke, smell and dirt and perhaps more than any other one advantage, it allows the valuable terminal property in the heart of the city to be used to the fullest extent. With electric trains not only can the surface of the ground be utilized but tracks can be laid underground and overhead on as many levels as may be desired. The electrification of the suburban lines of a railroad company may not result in an increase in direct revenue in proportion to the additional cost of making the change, but for a great railroad system there is a broader consideration. By giving satisfactory and frequent suburban train service the railroad not only builds up a prosperous community around its terminal but it gains the good-will of the individual members of that community and sells to them at a profit long haul passenger and freight transportation without competition from the other roads which look on suburban traffic as a nuisance and try to make the service so bad as to discourage it altogether.

Mr. Frank J. Sprague, member of the New York Central electric commission, spoke in a conservative strain on the possibilities of the future electrification of all steam roads. He pointed out that the success of any electrification scheme depended altogether on traffic density and not on load factor, as has been sometimes stated. For example, it would not be profitable to electrify a road 100 miles long which had only one train running on it continuously from end to end, even though the load factor would be 100 per cent. throughout 24 hours of the day. The use of direct current or alternating current depends solely on the density of traffic. For such applications as the Subway the direct current is as efficient as an alternating current system, but where the transmission lines are longer and substations further apart alternating current is the most efficient.

Mr. B. G. Lamme, Chief Engineer, Westinghouse Electric and Manufacturing Company, reviewed at some length the development of modern electrical machinery and pointed out that while for general commercial uses the size and voltage of motors and generators had increased enormously, for railroad work the size of the motors and the operating voltage had increased but little. Railroad motors are still built in sizes from 60 h.p. up to 350 h.p., and the line voltage had increased only from 500 volts to 650 volts. The very obvious way of increasing the capacity of railroad motors was to increase the voltage and not the amount of current supplied. If a 150-h.p. motor on a 600-volt circuit is replaced with a similar motor on a 6,000-volt circuit the power output is increased ten times with the same current consumption. Experiments are now being made with 6,000-volt motors and collecting devices. Direct current cannot, of course, be used at such high potential but the recent development of the single-phase alternating current motor, termed a series alternating or compensated motor, has made alternating current a commercial success in this field. Tests have shown that 6,000 volts can be collected from the conductors alongside of the track without arcing, and under the most unfavorable weather conditions the line leakage was extremely small. He was of the opinion that the third rail was not suited for yards or switch work and that some form of overhead construction for the power circuit was preferable. The catenary system of trolley wire suspension seemed to meet every requirement, and if a high voltage was used the weight and cost of such construction would not be excessive. Some form of sliding or roller contact was better than the trolley wheel for high speeds.

Mr. B. J. Arnold, another member of the New York Central Electric Commission, referred to the development of the single-phase alternating current motor and was of the

opinion that it would prove to be the ultimate solution of the electric railway problem. He thought that the future electrification of steam roads would start with some of the great trunk lines having a dense passenger traffic. At first only the passenger trains of a few of the larger roads would be run with electricity, but later the other roads would be compelled by the competition to also run their passenger trains in the same way, and finally freight also would be hauled by electricity not because of the less expense in operating but because of other advantages.

Mr. George Gibbs and Mr. White also spoke briefly, and Mr. Potter closed the discussion with a reply to some of the statements made by the other speakers.

Sale of the Rogers Works.

Announcement is made that the American Locomotive Company on Jan. 24 completed negotiations for the stock of the Rogers Works, at Paterson, N. J., and that delivery of the securities was made. The Rogers Works are capitalized at $2,000,000, of which $1,000,000 is preferred. The present company was incorporated in New Jersey in 1901, to take over the property of the old Rogers Locomotive Company, which was then in the hands of a receiver. Among those identified with the previous reorganization were William Barbour, E. H. Norton & Co., Elliott C. Smith, Frank P. Holran, Robert C. Pruyn, Stephen Peabody, Lawrence Turnara & Co., and J. B. M. Grosvenor. Since 1901 dividends have been regularly paid on the 6 per cent. preferred stock, and the common has received as much as 11 per cent. in one year. The new organization is as follows, under control of the American Locomotive Co.: President, John Havron (re-elected); Secretary, Leigh Best; Comptroller, C. E. Patterson; Directors, A. J. Pitkin, Chairman; Pliny Fisk, William M. Barnum, Frederick W. Stevens, George R. Sheldon, J. E. French, John W. Griggs, William Barbour, John Havron, Walter G. Oakman, and Reuben Wells. The American Locomotive Works now embraces the following plants: Montreal Works (newly acquired), Rogers Works (newly acquired), Schenectady Works, Brooks Works, Dunkirk, N. Y.; Pittsburg Works, Richmond Works, Cooke Works, Paterson, N. J.; Rhode Island Works, Providence; Dickson Works, Scranton, Pa.; Manchester Works, Manchester, N. H.

The Russian military authorities have made a report concerning the accidents on the Siberian Railroad since the war began. According to this 47 persons have been killed and 108 injured, which, considering that the road east of Lake Baikal was unfinished when the war broke out, yet had to be worked to its utmost capacity, is very creditable to the management. No less than nine of the killed and 24 of the injured belonged to the railroad guards, and suffered generally from their own fault, as they were walking, standing or lying on the track. The larger number of all injuries were due to drunkenness. Only three derailments are reported as causing fatalities.

The Ashtabula Concrete Bridge of the Lake Shore.

In connection with the extensive improvements that the Lake Shore has been making on its line between Buffalo and Cleveland, about a year ago it was decided to replace the old double-track steel and masonry bridge, across Ashtabula River, at Ashtabula, Ohio, with two 74-ft. concrete arches, built to carry four tracks. The old structure and the general lay of the river crossing as it appeared looking southward, May 5, 1904, is shown in Fig. 1. The sheet piling for the center pier of the new bridge had been driven, and also a trestle at the east end of the bridge, through which to dump concrete material from standard railroad cars. The gravel and clay in the river is underlaid with shale, which dips downward toward the west. At the west bench wall of the west new arch, the distance from the surface of the ground to good foundation was about 14 ft., at the center pier, between arches, about 10 ft., and at the east bench wall of the east new arch, about 2 ft.

A cross-section and half elevation of the new arches is shown in Fig. 2, and the position of the old masonry is indicated by broken lines. It will be noticed from this drawing that the east bench wall of the east new arch and the west bench wall of the west new arch were so located as to make necessary the removal of the masonry carrying the old bridge before the new work could be completed. The arches were covered by a dirt fill, 30 ft. deep over the crown of the arches. On this account it was necessary to have the barrels of the arches 145 ft. long. The numbers on the voussoirs indicate the order in which the blocks were built.

The south portion of the new arches was built first. When this part was completed a double-track temporary trestle was built on top of it and traffic then shifted from the old bridge to this temporary structure, permitting the removal of the old bridge. While the trestle was being built and the old bridge with its masonry was being removed, the north portion of the new arches was completed.

When the first sketch plan for a double concrete arch upon this location was made, it was not intended to provide as much waterway as is shown in Fig. 2, the desire being to keep the west face of the east bench wall of the east new arch a little in front of the old masonry, as was done on the west side of the river. This would have made the work more simple, because the arch centers under the old bridge could all have been placed without waiting to have the old masonry removed; in fact, it would have been unnecessary to remove the old masonry on the east side of the river. How-

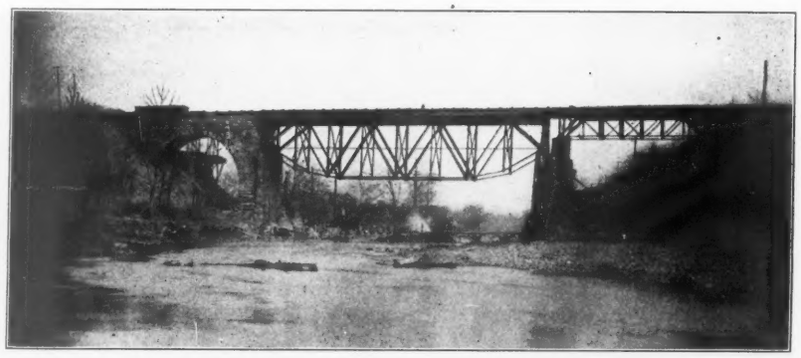


Fig. 1—Old Ashtabula Bridge of the Lake Shore (Looking Southward, May 5, 1904).

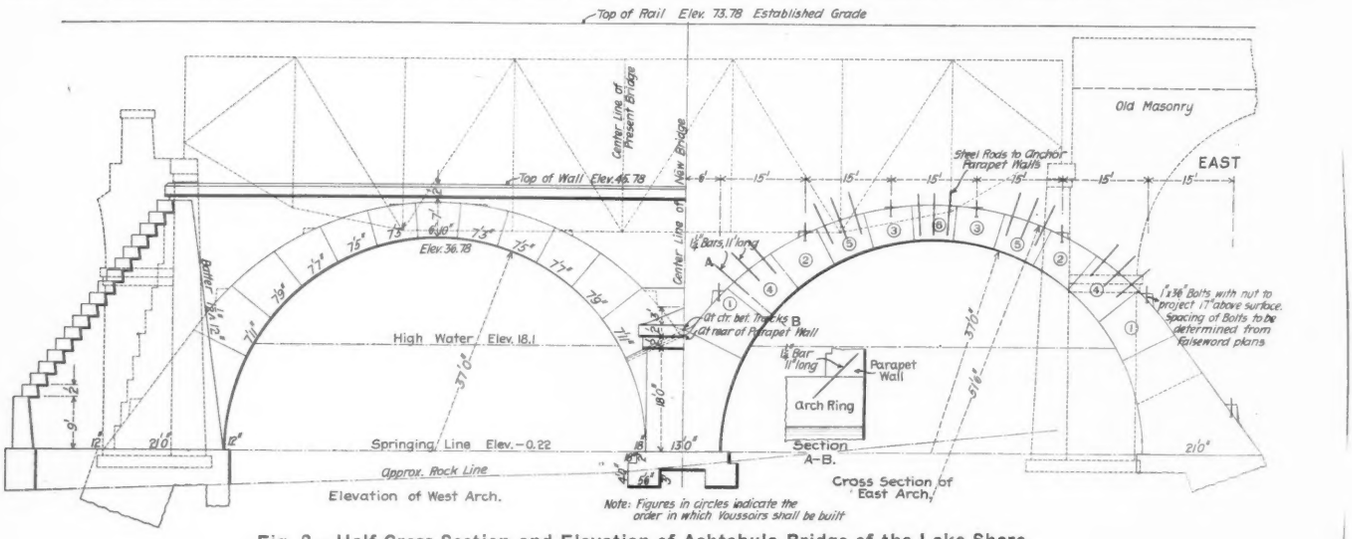

Top of Rail Elev. 73.78 Established Grade
Center Line of Present Bridge
Center Line of New Bridge
Old Masonry
Steel Rods to Anchor Parapet Walls
EAST
Top of Wall Elev. 46.78
Elev. 36.78
Batter 1/2" to 1'
High Water Elev. 18.1
Springing Line Elev. -0.22
Approx. Rock Line
Elevation of West Arch.
Arch Ring
Parapet Wall
Section A-B.
Cross Section of East Arch.
Note: Figures in circles indicate the order in which Voussoirs shall be built

Fig. 2—Half Cross-Section and Elevation of Ashtabula Bridge of the Lake Shore.

MILES OF RAILROAD WORKED BY THE BLOCK SYSTEM, JANUARY 1, 1905.—(See Notes on Next Page.)

	Automatic			Manual				
	Single track.	Double track.	Four track.	Single track.	Double track.	Four track.	Total.	Proposed.
Atchison, Topeka & Santa Fe	11.0	25.0	..	993.7	68.0	..	1,097.7	183
Atlanta & West Point—jointly with Central of Ga.	..	..	..	..	6.0	..	6.0	..
Atlantic City—(see Phila. & Reading)	—	—	—	—	—	—	—	—
Atlantic Coast Line	..	..	..	302.0	..	..	302.0	..
Baltimore & Ohio	3.8	104.1	..	126.0	570.6	1.5	806.0	238
Baltimore & Ohio Southwestern	—	—	—	—	31.6	2.8	34.4	—
Bessemer & Lake Erie	..	..	.	153.4	31.0	..	184.4	..
Boston Elevated	..	7.5	.	..	..	..	7.5	1
Boston & Albany	—	137.9	16.0	—	—	—	153.9	—
Boston & Maine	2.5	101.5	2.2	..	111.7	..	217.9	..
Buffalo, Rochester & Pittsburg	..	..	..	334.6	91.0	..	425.6	..
Central of Georgia	—	—	—	49.0	15.0	—	64.0	—
Central of New Jersey	..	161.7	32.0	..	..	..	193.7	..
Chesapeake & Ohio	..	..	..	918.5	196.0	..	1,114.5	..
Chicago & Alton	272.0	44.7	—	518.8	81.8	—	917.3	—
Chicago, Burlington & Quincy	..	21.4	6.0	1,415.3	437.0	..	1,879.7	Note.
Chicago & Eastern Illinois	8.0	..	..	604.0	113.0	..	725.0	..
Chicago Great Western	—	—	—	190.0	4.0	—	194.0	434
Chicago, Milwaukee & St. Paul	9.0	24.5	..	2,157.5	355.7	..	2,546.7	Some.
C., M. & St. P., for passenger trains and part of time for freights	..	..	..	4,301.3	..	..	4,301.3	..
Chicago & North Western	—	268.7	—	3,018.1	522.4	—	3,809.2	31
Chicago Terminal Transfer	0.6	5.0	..	..	..	..	5.6	..
Chicago, Rock Island & Pacific	..	15.0	..	1,521.0	..	..	1,536.0	..
Chicago & Western Indiana	—	—	—	—	19.8	—	19.8	—
Chicago, St. Paul, Minneapolis & Omaha	3.5	1.1	..	643.7	20.2	..	668.5	..
Cincinnati, Hamilton & Dayton	..	..	..	..	25.0	..	25.0	..
Cincinnati, New Orleans & Texas Pacific	292.0	7.2	—	14.0	—	—	313.2	21
Cleveland, Cincinnati, Chicago & St. Louis	..	..	..	670.0	124.0	..	794.0	..
Delaware & Hudson	5.3	33.2	..	..	..	..	38.5	99
Delaware, Lackawanna & Western	3.0	313.1	—	—	—	—	316.1	—
D., L. & W., three track—equal to	4.1	4.1	..	..	..	..	4.1	..
Erie	..	..	..	823.1	572.2	12.0	1,407.3	..
Grand Trunk (Portland Line)	—	—	—	197.9	—	—	197.9	—
Hannibal & St. Joseph (included in C., B. & Q.)	..	..	..	..	..	..	..	..
Illinois Central	6.0	188.0	14.0	239.0	..	..	447.0	210
Interborough Rapid Transit Co. (New York)	2.4	11.1	—	—	—	—	13.5	—
Kentucky & Indiana Bridge & Railroad Co.	..	..	..	7.4	2.0	..	9.4	..
Lake Shore & Michigan Southern	..	64.0	9.5	..	404.0	30.4	507.9	..
Lake Sh. & Mich. So. three track—equal to	12.0	12.0	—	20.3	20.3	—	32.3	—
Lehigh Valley	42.7	439.5	..	597.9	69.6	..	1,149.7	..
Lehigh Valley—third track	20.7	..	..	..	..	..	..	..
Long Island	—	46.3	—	32.5	—	—	78.8	—
Los Angeles Term. (See San Pedro, L. A. & P.)	..	..	..	..	..	..	..	..
Michigan Central	17.5	357.0	..	..	180.0	..	554.5	..
Missouri Pacific	72.0	19.0	—	—	—	—	91.0	—
Mobile & Ohio	4.2	..	..	20.0	..	..	24.2	7
Nashville, Chattanooga & St. Louis	..	..	..	46.0	5.6	..	51.6	42
New York Central & Hudson River	—	80.7	12.5	1,527.9	352.6	..	1,973.7	10
N. Y. C. & H. R., controlled manual	..	..	..	..	156.2	299.9	456.1	..
New York, New Haven & Hartford	25.0	217.7	..	195.8	168.9	70.6	678.0	..
New York, Ontario & Western	58.0	31.0	—	—	—	—	89.0	12
New York, Susquehanna & Western	..	..	..	1.4	22.2	..	23.6	..
New York & Long Branch	..	37.0	..	..	..	..	37.0	..
Norfolk & Western	12.0	—	—	1,030.7	131.7	—	1,174.4	82
N. & W. for passenger trains only	..	..	..	198.0	..	..	198.0	..
Northern Central (included in P. R. R.)	..	..	..	..	..	..	..	..
Northern Pacific	15.2	—	—	325.3	—	—	340.5	543
Ohio River Bridge	..	..	..	1.5	3.2	..	4.7	..
Oregon Short Line	31.0	..	..	..	..	..	31.0	..
Pennsylvania	4.2	77.2	218.3	189.7	745.1	350.1	1,584.6	136
Penn., West of Pittsburg	..	10.0	29.0	294.0	934.0	..	1,267.0	952
Peoria & Pekin Union	..	1.0	..	..	5.4	..	6.4	..
Pere Marquette	9.5	—	—	—	—	—	9.5	—
Philadelphia & Reading	22.2	319.6	3.0	189.0	114.3	..	648.1	47
P. & R., three track line equal to	28.2	28.2	..	..	..	..	28.2	..
Phila., Balt. & Wash. (included in P. R. R.)	—	—	—	—	—	—	—	—
Pittsburg & Lake Erie	..	110.2	20.3	30.5	23.6	..	184.6	..
Pitts. & Lake Erie, three tracks—equal to	4.8	4.8	..	..	..	..	4.8	..
Rich., Fredksbg & Pot. (including Wash. Southrn	—	—	—	57.8	55.7	—	113.5	—
San Pedro, Los Angeles & Pacific	..	2.0	..	..	..	..	2.0	..
South Side Elevated, Chicago	..	8.7	..	..	..	..	8.7	..
Southern Railway	—	2.0	—	249.0	74.8	—	325.8	327
So. Ry., passenger trains only	..	..	..	5,935.0	..	..	5,935.0	..
Southern Pacific	256.0	..	..	174.0	..	..	430.0	333
So. Pac., Texas lines	55.0	—	—	—	—	—	55.0	70
St. Louis, Keokuk & Nor. Westn (see C., B. & Q.)	..	..	..	..	..	..	..	..
St. Louis & San Francisco	6.5	4.0	..	303.6	27.7	..	341.8	..
Staten Island Rapid Transit	..	8.7	..	..	..	..	8.7	..
Terminal R. R. Assoc'n, St. Louis	—	19.4	—	—	4.7	—	24.1	—
Union Pacific	13.4	45.4	..	..	..	..	58.8	..
Vandalia	—	—	—	241.0	—	—	241.0	—
Wabash Railroad	..	..	..	1,005.3	26.6	..	1,031.9	..
West Jersey & Seashore (included in P. R. R.)	..	..	..	..	..	..	..	..
Wisconsin Central	—	—	—	—	4.5	..	4.5	..
Total	1,333.3	3,420.2	362.8	31,864.5	6,928.7	767.3	44,586.7	3,778

only in times of fog or for passenger trains only are:

	Miles.
Buffalo, Rochester & Pittsburg	425.6
Chicago & Alton	518.8
Chicago, Milwaukee & St. Paul	4,301.3
Grand Trunk	197.9
Michigan Central	180.0
Norfolk & Western	198.0
Southern	5,935.0
Total	11,756.6
Deducting this mileage from the total (44,574.7) given above, leaves a final net total of lines constantly block-signalled of	32,818.1
Same one year ago	26,881.1
Showing an increase for the year of	5,937.1

The present total is divided as follows:

Automatic	5,026.2
Manual	27,791.9
	32,818.1

Some other comparisons will be found in the editorial column.

NOTES ON THE TABLE.

Atchison, T. & S. F.: Of the 993.7 miles manual blocking, a length of 32.9 is worked by the electric train staff. The mileage worked by train staff is less than it was a year ago, in consequence of the extension of double track. The work proposed for this year consists of 30 miles automatic and 153 miles manual, all single track.

Baltimore & Ohio: The proposed new work consists of 60 miles double track automatic signals and 178 miles single track manual.

Boston & Albany: In many places on this line the eastbound track is signaled and the westbound is not, and vice versa.

Boston Elevated: The signals on this line have an automatic stop.

Buffalo, Rochester & Pittsburg: Block signals usually used for passenger trains only.

Central of Georgia: Includes six miles used jointly with Atlanta & West Point and six jointly with the Southern Railway.

Chesapeake & Ohio: Of the single track line 256 miles has Leonard's lock and block apparatus, and seven miles is worked by electric train staff.

Chicago & Alton: The manual signals on the single track lines are used usually for passenger trains only, except on 16.2 miles, where the electric train staff is used.

Chicago, Burlington & Quincy: The company intends to extend the manual block system throughout its main lines in the near future. The total length of Burlington lines is 8,549 miles.

Chicago Great Western: Of the proposed new signaling, four miles, double track automatic and 150 miles single track manual will probably be in operation within three months.

Chicago & North Western: The proposed new signals will be Hall automatics, between Barrington and Harvard, taking the place of the manual system.

Cincinnati, N. O. & T. P.: The 14 miles manual is worked by the electric train staff. The new work proposed consists of automatic signals, 18 miles single track and 3½ miles double track.

Delaware & Hudson: The proposed new signaling is automatic; 57.4 miles single track and 41.8 miles double track. Hall electro gas signals will be used, arranged normal-danger. The company proposes to block-signal all of its main lines as promptly as possible. About 22 miles of the new signals are already under construction and 40 miles will be begun early in the spring.

Erie: The four-track portion and about 40 miles of the double track have controlled manual signals.

Grand Trunk: Block signals used for passenger trains only. The same system is used on the company's lines in Canada.

Illinois Central: The manual signals have an electric controlling apparatus from station to station; and the proposed new work will be of this manual controlled system.

Interborough R. T.: Six and one-half miles of this company's line is four-track, but only two of the four tracks have block signals. The signals are equipped with automatic stops.

Michigan Central: The manual signals are usually used for the rear of passenger trains only.

Mobile & Ohio: The proposed new work consists of manual signals on single track.

Nashville, C. & St. L.: The proposed new signaling is single track, manual.

New York Central: The proposed new signaling is automatic, double track.

New York, O. & W.: The proposed new signals are automatic.

Norfolk & Western: Of the proposed new work 80 miles will be double track automatic signals and two miles single track automatic.

Northern Pacific: The proposed new signaling consists of the following, all manual:

St. Paul Division:	
Northtown Junction to Staples	153 miles.
Rocky Mountain Division:	
Garrison to Missoula	74 "
Missoula to Dixon	44 "
Idaho Division:	
Spokane to Pasco	145.7 "
Pasco to Ellensburg	126.8 "
	543.5 "

Pennsylvania: Of the proposed new signals 11 miles will be automatic double track and 125 manual double track.

Penn. W. Pittsburg: All of the through lines from Pittsburg to Chicago and St. Louis are now block signaled. The proposed new work consists of automatic signals 78 miles double track; manual signals 812 miles single track, and 62 miles double track.

Philadelphia & Reading: Of the proposed new signals 5.4 miles will be automatic on a three-track line and 41 miles will be manual on a single track line.

Structural Steel for the Lehigh Valley Locomotive Repair Shops at Sayre, Pa.

The ground covered by the four buildings described herein amounts to about 379,000 sq. ft., or nearly 8¾ acres. The main locomotive shop alone covers over 274,000 sq. ft., or 6⅓ acres. The blacksmith shop and store house are each 103 ft. x 363 ft., and the power house is 125 ft. x 240 ft. The steelwork was designed and the steel construction checked and approved by Mr. D. C. Newman Collins, Consulting Engineer, 29 Broadway, New York, under the direct supervision and general approval of Mr. Walter G. Berg, Chief Engineer, and Mr. E. D. B. Brown, Architect of the Lehigh Valley. The details of the shop and field inspection of materials were in charge of Mr. F. E. Schall, Bridge Engineer of the Lehigh Valley.

The general layout and a brief description of these shops was shown in the *Railroad Gazette* March 18, 1904. The two outside bays have a clear height of 50 ft. to the bottom chord of the trusses and are used for general erecting purposes and for boiler work. The entire central portion of the building, between the erecting shop bays, has a clear and uniform height of 34 ft. 4 in. to the under side of the roof girders which carry a regular system of skylights of the saw-tooth type, having the glass inclined toward the north at an angle of 60 deg. from a horizontal line. The gallery, in the center bay, has its elevation fixed at 21 ft. 6 in. above the main floor, and is intended for the convenient disposal of the heating units, lavatories, lockers and for light storage. This leaves the three center bays with a clear floor for machine shop purposes.

The length of this building is 749 ft., divided into 30 bays or panels of 24 ft. each, and having one half panel at each end of the building which can be removed when future extensions are decided upon; all details and sizes are designed with this in view. The brick walls, surrounding the steel frame, rest upon their own foundations and are independent of the steel frame except by being anchored to the heavier parts of the posts "P1," and being built into the flanges of the upper section of these posts. The gable walls all run above the finished roof to afford protection against fire and to present a better finish architecturally. All roofs are covered with reinforced cinder concrete built to provide for expansion and covered with tarred felt roofing and granulated slag.

The two erecting shop bays have a monitor running full length of the building with pivoted sash on the sides inclined at an angle of 60 deg. from a horizontal line. The vertical sides of the erecting shop, above the saw-tooth portion, are covered with pivoted and fixed sash surrounded by reinforced cinder concrete slabs on steel siding. The gallery floor is of reinforced cinder concrete also. The riveting tower, in the boiler shop section, obtains the necessary clear height by adopting a pit riveter without the necessity for running up the building into an unsightly tower as is generally done.

The main posts are left open, for convenient inspection and painting from time to time, except near the floor where they are boxed in with steel plates; these boxes are filled with concrete having the top sloped off to such a pitch as to prevent the possibility of an accumulation of dirt, waste or other inflammable material.

ASSUMED LOADS.

The roof is assumed to weigh 75 lbs. per sq. ft. of horizontal projection, which assumption includes the dead weight of material and the weight of snow and the wind pressure. The saw-tooth roof is, however, assumed at 85 lbs. in view of the probability of large masses of snow accumulating upon it.

Two end trusses in each erecting shop bay are made heavier to permit of lifting the crane crab from the bridge; this load was taken at 50,000 lbs. concentrated at any point on the bottom chord of the trusses, in addition to the above assumed roof load. All girders under the saw-tooth portion, in line with these special trusses, were also increased in section by an assumed load of 16,000 lbs. at any point on the bottom chord for the same purpose. In the south end of one of the erecting shop bays the regular roof trusses were omitted and heavy box girders of exactly the same profile were substituted; they were designed to carry, in addition to the regular roof load, a special riveting tower crane of 20 tons capacity on a runway provided for it on the side of each girder. This crane has two two-wheel trucks with a maximum load of 32,000 lbs. on each wheel and a wheel base of 6 ft.

The gallery load was assumed at 200 lbs. per sq. ft. of floor for the live load; the gross load was 240 lbs. and special loading and framing introduced for the support of the heating units where required.

THE CRANE LOADS.

The upper craneway in the two erecting shop bays is designed to carry an electric crane of 120 tons capacity for lifting a locomotive bodily over others and lowering it over a pit selected for its repairs. These cranes have two four-wheel trucks with wheels spaced 4 ft. centers, making a total wheel base of 12 ft., and a maximum load

of 87,000 lbs. on each wheel. The crane rails here used weigh 150 lbs. per lineal yard.

The lower cranes in the erecting shop bays, as well as the two 60 ft. span cranes in the machine shop, are of 15 tons capacity, having two two-wheel trucks with a wheel base of 10 ft. and an assumed maximum load of 35,000 lbs. on each wheel; the 15 ton cranes in each of the 42 ft. bays are like the other 15 ton cranes, except the wheel loads, which were assumed at 30,000 lbs. All rails for the 15 ton cranes were of a weight of 58 lbs. per lineal yard.

WORKING STRESSES.

The working stresses of all steel were based on a soft-medium grade of a desired ultimate strength of 60,000 lbs. per sq. in.; tests to be confined within limits of 5,000 lbs. above or below this amount. Rivet steel was of a soft grade with a desired ultimate tensile strength of 50,000 lbs. The phosphorus limitations were .08 per cent. for acid and .04 per cent. for basic manufacture, and the sulphur limits were .05 per cent. for all grades of soft-medium material. The soft grade of steel was restricted to 5 per cent. of phosphorus or sulphur. The specifications also called for the necessary tests and inspection of all material to insure its being of the best quality for the purpose. The following working stresses were used: Tension members, 15,000 lbs. per sq. in.; compression members, 12,000 lbs. per sq. in., reduced by the Rankin-Gordon formula; crane girders, 12,000 lbs. per sq. in. net section; rolled beams and channels, 16,000 lbs. per sq. in.; web shear, 9,000 lbs. per sq. in.; shop rivets, 9,000 lbs. shear, 18,000 lbs. bearing; field rivets and bolts, 7,200 lbs. shear, 14,400 bearing. The bearing of steel on concrete was proportioned so as not to exceed 200 lbs. per sq. in. under the most extreme combination of pressures and the concrete bearing on soil not over two tons per sq. ft. under the same conditions.

The stresses due to horizontal wind pressure, for convenience in calculation, were proportioned to the working stresses given above and on a basis of wind at 20 lbs. per sq. ft. of vertical projection of surfaces. This is equivalent to an assumption where the extreme possibilities of a uniform pressure of 40 lbs. per sq. ft. would not strain the metal beyond the elastic limit. The thrust produced by the action of overhead crane loads was assumed as ample to safely meet all combined requirements. In consideration of the maximum lateral forces, due to the combined action of cranes and wind, being always of a temporary nature, seldom likely to occur simultaneously with the greatest combination of assumed vertical loads for which ample material is provided, this wind assumption seems to be enough to safely meet the most extreme possibilities. The given value for proportioning the number of field rivets was purposely taken low in order to provide an excess of strength in all connections that were to be riveted at the site.

THE STEEL DESIGN.

The building was treated in design as a series of craneways, capable of withstanding all lateral pressures and forces, and depending on the lighter roof construction merely as a covering. The main posts were carried below the floor just far enough to bury all obstructions to a clear passageway around them. All posts "P1" and "P2" were anchored to the concrete piers with four bolts 2½ in. in diameter, and posts "P3" and "P4" to their respective piers with four bolts 2¼ in. in diameter to each post. This anchorage, together with the sway bracing over the gallery and with the aid of the dead weight of the building itself, are sufficient to withstand the most severe combination of lateral forces without depending on the brickwork for assistance.

The anchor bolts for all main posts were set in circular metal boxes, 12 in. long and about 4 in. in diameter, to permit a possibility of adjustment of the tops of the anchor bolts after the concrete mass hardened. The posts were leveled up on steel wedges and thoroughly grouted to a solid bearing; 2½ in. holes were punched in all base plates of the posts to facilitate the flow of cement grout and the anchor bolts, by this means, were firmly secured in position.

Expansion of material due to temperature changes was arranged for laterally by designing the top section of all posts "P3" in two parts, practically a split post, connected by gussets and slotted holes which allow two inches of space for temperature changes in a distance of 78 ft. (from "P3" to the center of the building) and 102 ft. (from "P3" to the outside of the building). All lateral field connections were riveted except the slotted holes in the top of posts "P3."

Longitudinal stiffness and expansion of material was provided for by a series of braced tower bents, every third panel, leaving two unbraced panels between each. At each point between these two unbraced panels all heavy members were specially designed with expansion joints to allow space for 1 in. at each; these were 72 ft. apart. The longitudinal roof members were generally bolted together at the building to avoid the expensive, tedious and unnecessary work of inconvenient riveting, except in the braced panels where everything was riveted to make the bracing effective. The space allowed for expansion in this light material was assumed as being provided for in the accumulated clearances in the many bolted connections.

The girders under the saw-tooth trusses, it may be noted, are not of an economical depth because the additional cost of this shallow limit was warranted by the desirability of getting the skylights as low as possible both for their own efficiency and for that of the erecting shop windows beside them. Special saw-tooth trusses were placed in five of the panels that came opposite the heating units which were made to allow space for the passage of the large heat pipes; the saw-tooth trusses were 12 ft. apart.

LINE SHAFTS AND MOTOR BRACKETS.

The original layout provided for continuous line shafts located under the crane girders at posts "P3" and also under the center of the gallery girders; there are three in all. These line shafts are each to be driven by seven motors so arranged that one motor can drive them and others be coupled in as needed. These crane girders, at posts "P3," are studied particularly as regards lateral and vertical deflection and are arranged to carry the hangers for support of the main shafts to be secured to wood ties clamped to the bottom flanges of the two girders. The motors are on steel brackets on the posts about 12 ft. above the floor and are assumed to weigh 7,000 lbs. each. Brackets for the jack-shafts are placed on all posts "P3" and "P4," under or near the main shafts, and three longitudinal 12 in. beams are provided on each row of them for the convenient fastening of wood ties to carry the jack-shaft hangers. These jack-shafts are driven by belt from the main shafts and will admit of changes "ad libitum" in belting to any number of small machines. For convenient adjustment, these brackets were all made in duplicate so that the motor brackets can be located or changed wherever necessary.

Lehigh Valley Repair Shops at Sayre, Pa.

The erecting shop roof is framed with light angle trussed purlins running longitudinally and each well braced from the bottom chord of the roof trusses to prevent vibration. They carry 7 in. channel rafters 6 in. centers on which the concrete is laid. At the outside eave a 9 in. channel is placed both to afford a permanent longitudinal tie and also to provide temporary support for the rafters. The saw-tooth trusses connecting to posts "P3" and "P4" are made with a bottom chord composed of two 6 in. channels to afford additional tie and bracing to these posts. Four 6 ft. x 8 ft. loading platforms or pulpits are along the gallery floor, and are designed to carry a live load of 200 lbs. per sq. ft. Framing for the eight flights of circular stairs were provided in the gallery floor framing; also all necessary steel ladders to afford access to the crane cages, to the roof and for cleaning skylights. No metal was used in the design of less thickness than ¼ in.

The crane girders were proportioned with

liberal width of top chord and were reinforced to better withstand the tendency to lateral deflection due to the action of moving loads. They were carefully arranged to be free from connected bracing so that they are at liberty to deflect vertically with the minimum amount of vibration to the structure. All stiffeners are straight angles on fillers and bear at top and bottom to afford the best support for the wheel loads. These girders are all riveted in solid in all braced bays and have riveted connections even at the expansion points.

BLACKSMITH SHOP.

This building is arranged with the roof trusses in one span of 100 ft. and the trusses are anchored at each end to stone blocks built into the walls. The clear height to the bottom chord of the trusses is 20 ft. No provision for expansion was made in a lateral direction as it was considered safer to require a wall 20 ft. high to accept this duty rather than to expect it to withstand the pushing and pulling of a loose roller bearing that might gradually creep off its support and cause disaster.

No material was used of less thickness than $^5/_{16}$ in. on account of corrosion, and the bottom chord of the trusses were made stiff and heavy to provide support for the probable concentration likely to be hung upon them. A monitor with sash, skylights and louvres runs full length of the building and also provides ventilation at the extreme peak by means of an additional small monitor with open louvres. An I-beam trolleyway passes through the building and is to be equipped with a triplex block and trolley.

No provision is made in the roof framing for the lateral support of the future jib-cranes as their exact location was difficult to determine. Iron blocks were therefore set into the walls under each roof truss bearing, which is detailed to provide connections for any future system of rod bracing that may be needed.

The gross roof load was assumed at 80 lbs. per sq. ft. Three panels of rod bracing is introduced in the roof framing to stiffen things generally and all holes necessary for the fastening of wood, glass and other material were punched in the steel at the shops before erection.

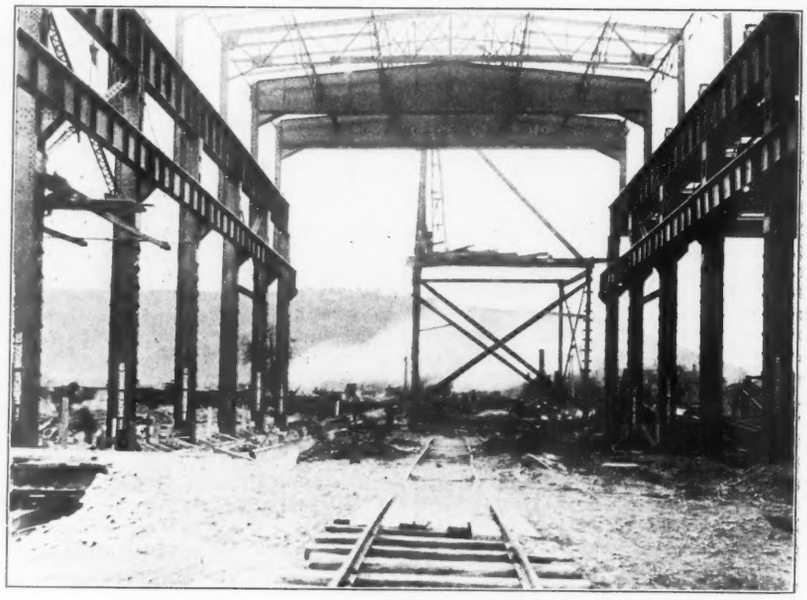
STOREHOUSE.

This building is divided into two parts, of equal size, by a transverse fire wall. The north half is equipped with transverse hand power cranes of five and 15 tons capacity. The roof trusses are designed to carry a gross load of 75 lbs. per sq. ft., and the trusses are supported by two rows of posts running longitudinally as well as by the outside walls. A liberal monitor is provided through the center with ample light.

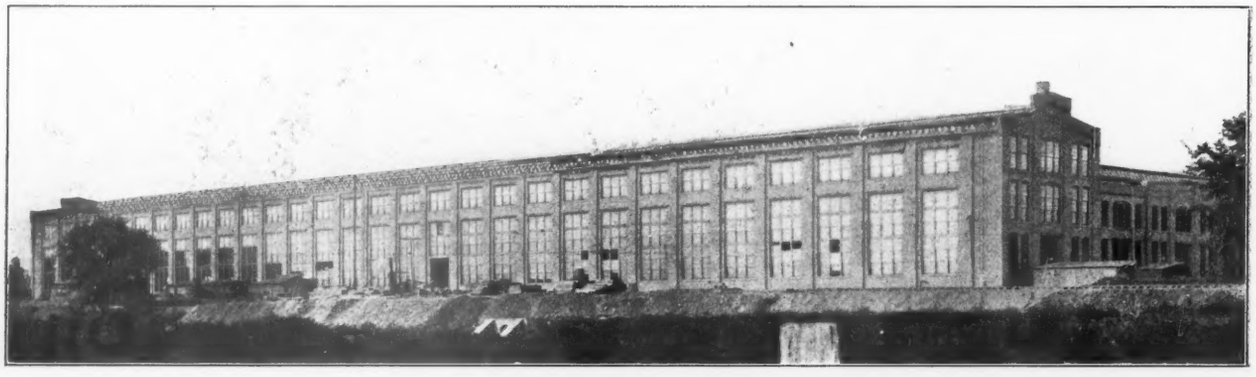
The clear height of the building to the bottom chord of the trusses is 17 ft. above the floor and 21 ft. above the top of the pit rail. Lateral bracing is called for in the roof to counteract the effects of lateral pressures and the action of the cranes. Steel ladders were on the plans to afford convenient access to the monitor and to the roof.

POWER HOUSE.

The roof trusses here rest upon, and are anchored to, the brick walls at the sides of the building as well as to the center longitudinal fire wall. They are designed to carry a gross load of 85 lbs. per sq. ft., in



Main Locomotive Shop Showing Riveting Tower Girders.



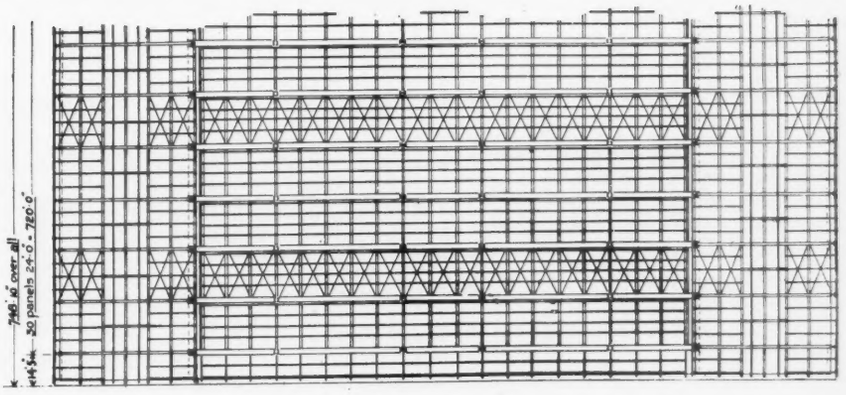
Main Locomotive Repair Shop of the Lehigh Valley at Sayre, Pa.

Interior of Main Locomotive Shop.

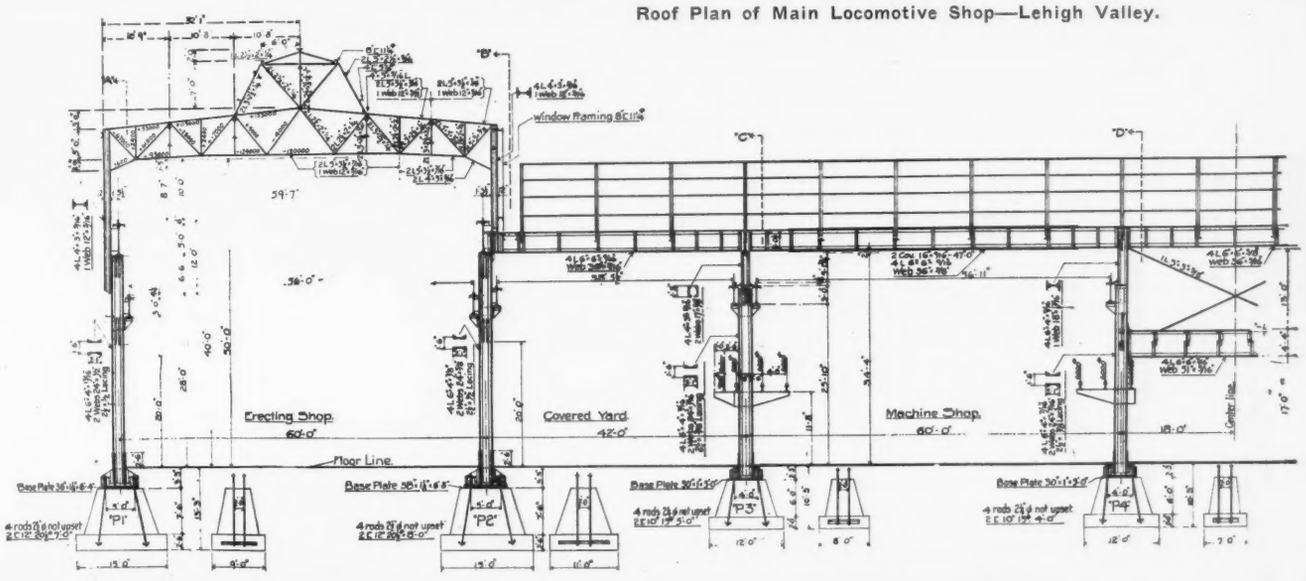
addition to 2,000 lbs. concentrated at any point on the bottom chord. The boiler house trusses have in addition to this a load of 4,000 lbs. on the bottom chord at the center, as the assumed weight of a coal conveyor.

A monitor with sash on two sides and two separate rows of skylights are introduced over the boiler house; portions of the skylight are movable for the convenient removal of upright boiler tubes. The engine house has one row of skylights. One 20 ton crane with two two-wheel trucks is located here. The wheel base is 10 ft. and the assumed load on each wheel is 38,000 lbs.

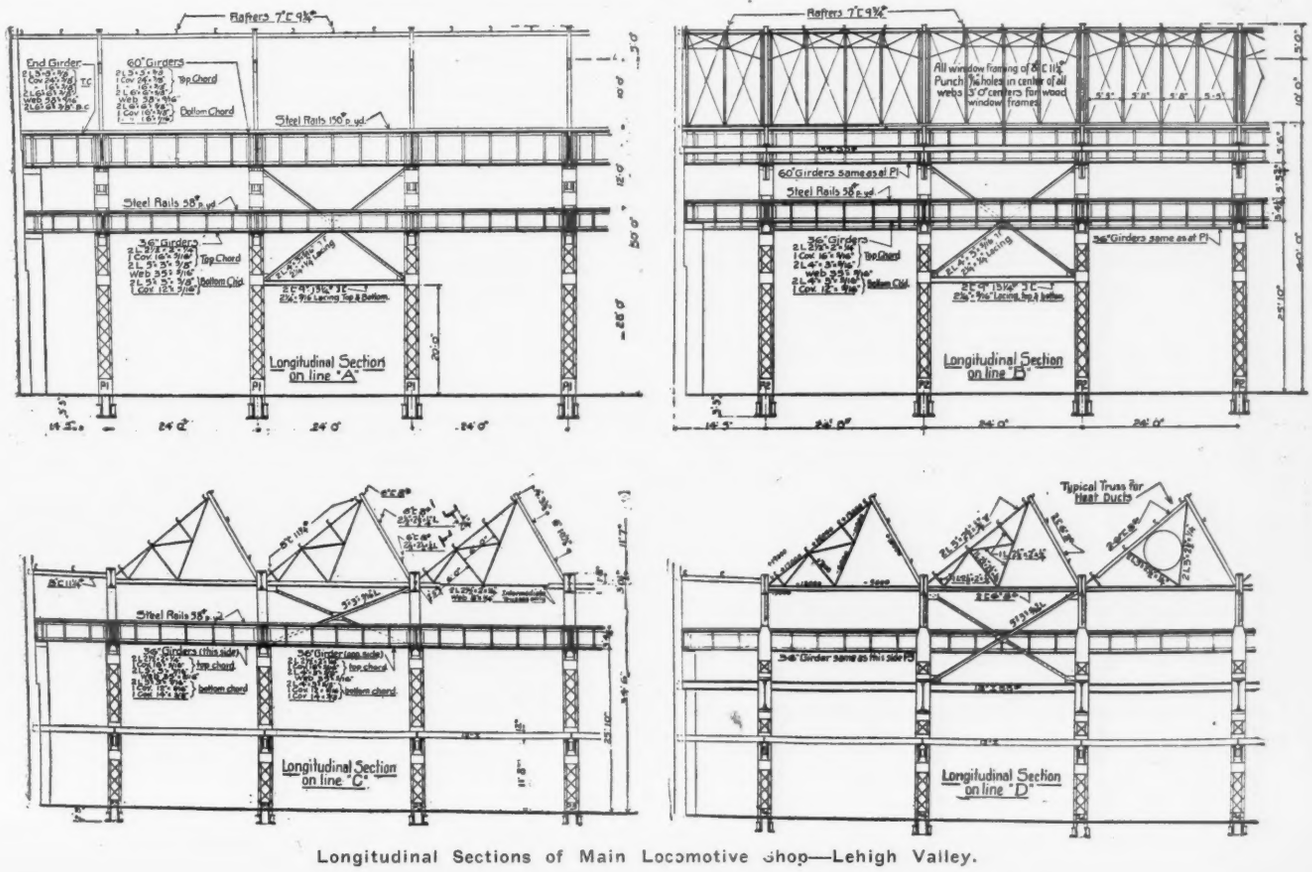
The engine house floor is calculated to carry a live load of 400 lbs. per sq. ft. in



Roof Plan of Main Locomotive Shop—Lehigh Valley.



Typical Cross-Section of One-Half of Main Locomotive Shop—Lehigh Valley.

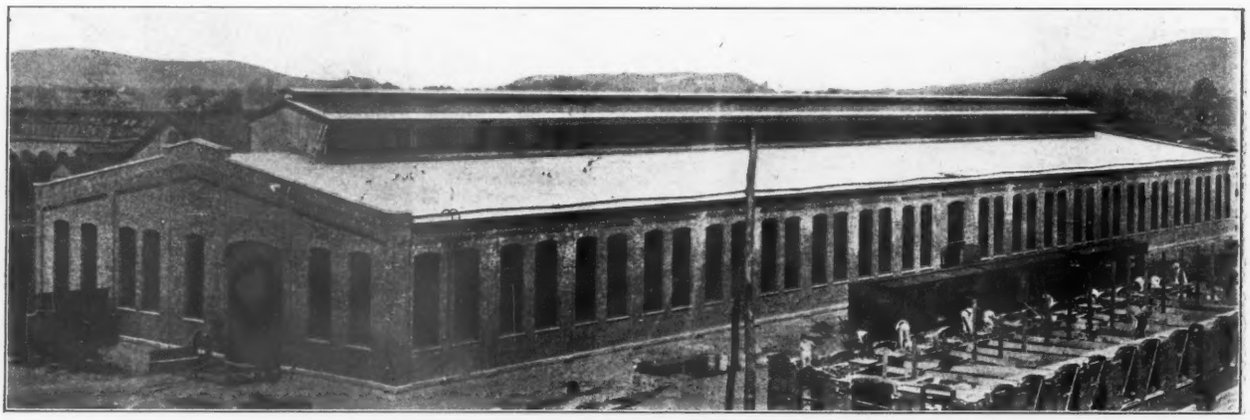

Rafters 7"I 9¾
End Girder
60' Girders
Top Chord
Bottom Chord
Steel Rails 150 lb. yd.
Steel Rails 56 lb. yd.
36" Girders
Longitudinal Section on line "A"
All window framing of 8"C 11½ Punch ⅞" holes in center of all webs 3'-0" centers for wood window frames
60' Girders same as at P1
36" Girders same as at P1
Longitudinal Section on line "B"
Steel Rails 56 lb. yd.
36" Girders (this side)
36" Girder (opp. side)
Longitudinal Section on line "C"
Typical Truss for Heat Ducts
36" Girder same as this side P3
Longitudinal Section on line "D"

Longitudinal Sections of Main Locomotive Shop—Lehigh Valley.

addition to the weight of floor material. Grillage is included for the support of boilers and tunnels over the smoke flues and also for the support of the steel coal pocket posts which are located over the flues or tunnels.

Two steel coal pockets are built in the boiler house with a capacity of 260 tons each. They have hopper bottoms and are plate lined. The ash bins and coal conveying tower is of steel and has a reinforced cinder concrete roof covering with tarred felt and granulated slag. The sides are covered with corrugated, galvanized iron. Each of the two ash bins have a capacity of 3,000 cu. ft., and are lined with reinforced cinder concrete. This tower also includes supports and facilities for fastening all coal conveying machinery, ash hoists and for the convenient loading and unloading and crushing of coal.

The roof of each building in this group has the same covering of reinforced cinder concrete covered with tarred felt and granulated slag. All holes were carefully incorporated in the original design for the fastening of the work of other trades so that they could be punched at the shops rather than have to undergo the tedious and expnsive process of drilling in the field. All stresses and sizes of material were carefully and fully shown in the plans side by side to facilitate the ready completion of the work; all governing sizes of members and of connections were thoroughly fixed at the start for the use of the various trades; all details of the shop work were promptly checked and approved to avoid delay. The work was then quickly, accurately and satisfactorily executed in the shops of the American Bridge Company.



Blacksmith Shop—Sayre Shops of the Lehigh Valley.

Court Decisions on Interstate Commerce.*

The decision of the court in the Chesapeake & Ohio coal case, rendered on Feb. 19, 1904, (128 Fed. Rep., 59) is peculiar in that, while the case was brought by the Commission under the Elkins law, and the object of the injunction was the restraining of the Chesapeake & Ohio from carrying coal at less than its published tariff rates, with the like restraint upon the New York, New Haven & Hartford Railroad Company as to receiving concessions from the tariff rates on coal consigned to it, the court decided the case under the third section or undue preference clause of the act to regulate commerce. The contract between the Chesapeake & Ohio and the New York, New Haven & Hartford under which the coal for the latter [for fuel for its locomotives] was furnished by the Chesapeake & Ohio upon such terms that the C. & O. could not and did not receive for the transportation its published tariff rates, and the subsequent agreement between the C. & O. and the New Haven to furnish the latter company in 1903 with 60,000 tons of coal, the amount remaining undelivered under the old contract, were held to operate to give the purchaser, the New Haven road, an undue advantage; and the contract and agreement were declared to be illegal and unenforceable. The further performance of the agreement in 1903 for the sale and shipment of the coal was enjoined. The court declined, however, to enjoin the Chesapeake & Ohio from further departing from its tariff rates in the transportation of coal or of interstate traffic generally, and this was, of course, the object of the proceeding by the Commission. Appeals to the Supreme Court were taken both by the Commission and the New Haven road.

In the California orange cases the circuit court for the southern district of California has rendered its decision, but the case has not yet been recorded. The Southern Pacific and Atchison, Topeka & Santa Fe, as initial carriers from southern California in joint continuous routes to eastern markets, adopted a regulation whereby they reserved to themselves exclusive control of the routing and denied to shippers any choice. Under such a regulation the rate or tariff may be available to one shipper, but not to another, and open one minute to a shipper, but closed the next. In its decision. based upon the record before the Commission and the additional testimony taken, the court found that these carriers were engaged in pooling, in violation of section 5 of the act to regulate commerce, and said that its conclusions on the pooling issue rendered it unnecessary to pass upon any of the other questions alleged in the case. The principal rulings of the court in relation to the question of pooling were as follows:

A pool is constituted whenever the contract or agreement provides any special means or agency for apportioning the freights which destroys the rivalry which would otherwise exist between the railroads, and a contract or agreement by which the apportionment is left absolutely and unqualifiedly to the will of the initial carrier, accomplishes this end as effectually as though definite percentages were fixed in the contract. The prohibition of section 5 against pooling freights protects competition in rate as well as in service. Any contract, agreement, or combination between different and competing railroads whereby the volume or quantity of freights is apportioned by any special means or agency which was intended to, and does, suppress competition, either in rate or service, is a traffic pool within the meaning of section 5. A rule or regulation in a joint tariff, reserving to the initial carrier the absolute and unqualified right of routing beyond its own terminal, is a contract between common carriers who are parties to said tariff. The Interstate Commerce Commission, in directing common carriers to desist from an unlawful practice, performs a judicial function which is entirely lawful.

Miscellaneous Cases.—On appeal from a decree of the Circuit Court of Appeals the United States Supreme Court last February held that neither the act to regulate commerce nor any provision in the constitution of the State of Kentucky imposes an obligation upon a railroad having its own stock yards in Louisville under a lease from a stock yard company to accept live stock from other states for delivery at the stock yards of another railroad in the same city and neighborhood, although there is a physical connection between the two roads.

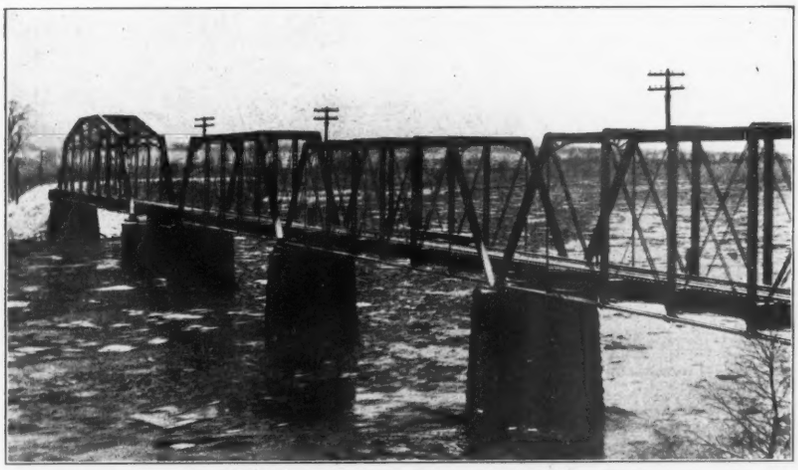
The right of the Government of the United States in buying transportation on a railroad for its soldiers in lots of ten or more to a reduced ten-party rate was denied by the Circuit Court of Appeals for the seventh circuit in the recent case of United States vs. Chicago & North Western (127 Fed. Rep., 785). The court held that the refusal to give the Government the party rates it gave to theatrical, hunting, and other parties did not constitute an unjust discrimination where it was shown that the purpose and effect of the party rate given by the schedule was to increase the company's business, and that tickets sold thereunder were closely limited in time and were paid for in cash in advance, while those furnished to the Government were not so limited, were furnished on a requisition, and were only paid for after indefinite delay in the auditing and allowance of the claims by the War and Treasury Departments.

*From the annual report of the Interstate Commerce Commission.

Rebuilding the Big Four Bridge at Terre Haute.

The Cleveland, Cincinnati, Chicago & St. Louis (Big Four) is engaged in rebuilding a part of its Wabash River bridge at Terre Haute, Ind. The portion undergoing change comprises the three Pratt truss spans, each approximately 124 ft. long, at the east end, practically one-half of the structure. The two spans furthest east were built more than 20 years ago and the other about 12 years ago, all three being too light for present loading. They are being replaced with two 184-ft. spans, requiring the construction of two new piers, the old pier at the west end of the rebuilt portion being too light for the new structure.

One of the illustrations shows profiles of the river at two points, one being directly



Big Four Bridge at Terre Haute which is being Rebuilt.

under the bridge and the other 50 ft. down stream, the record extending over 15 years and showing the effects of scouring during that period. It should be explained that the bridge originally consisted of four Pratt truss spans of the length already given, a short draw span, and a plate-girder approach at the west end.

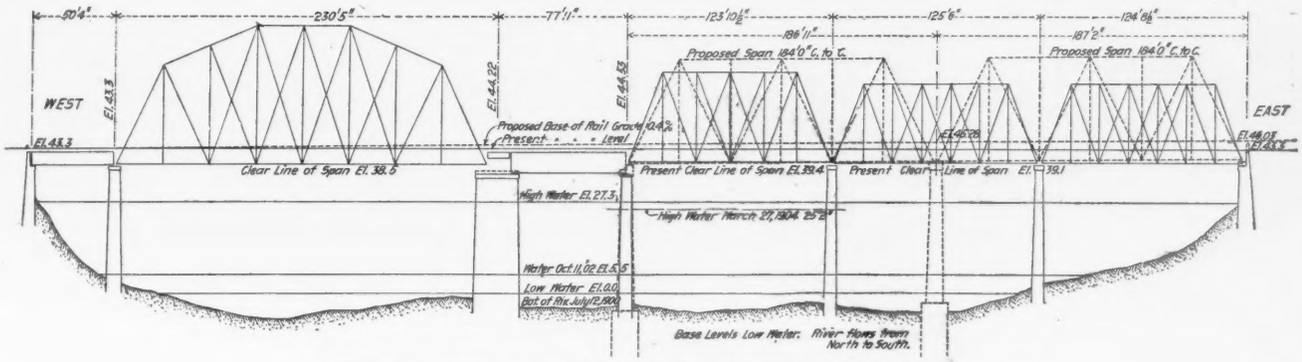
The large pier in the profile supported the draw span. The wreck of the west portion of this bridge by a freight train in 1900 is well remembered, and was described in the *Railroad Gazette* at the time (March 2, 1900). The wreck was due to the undermining of the pier shown in dotted lines, the effect of the scouring at this point being plainly indicated in the profile. The short girder span and long truss span replaced the wrecked portion.

In the two profiles it will be noticed that the one 50 ft. down stream shows a depth of about 25 ft. greater than under the bridge. This is believed to be due to the piers, and also to the presence in the river under the bridge of a very large amount of riprap, dumped there years ago, for reasons unknown to anyone connected with the company at the present time. Further down the river about 75 ft. the depth is even greater than at the point shown.

The piers shown in the profile are the old piers, all of which were built in 1872. As already mentioned, the three easterly ones have been replaced by two new piers, which are shown in dotted lines on the elevation. These piers are concrete, sunk by pneumatic caisson to a depth of 30 to 45 ft. below the present bed of the river. The first plan proposed for the betterment of the bridge contemplated the use of five 74-ft. girders, but after attempting to get a foundation for piers for these spans it was found that it would be an expensive thing to do, and the present plan of two spans was adopted. The river bottom being mostly of sand and gravel, it was necessary to sink the foundations deep enough to avoid possible trouble from scouring. In excavating for the foundations, tons of riprap, mentioned above, had to be removed.

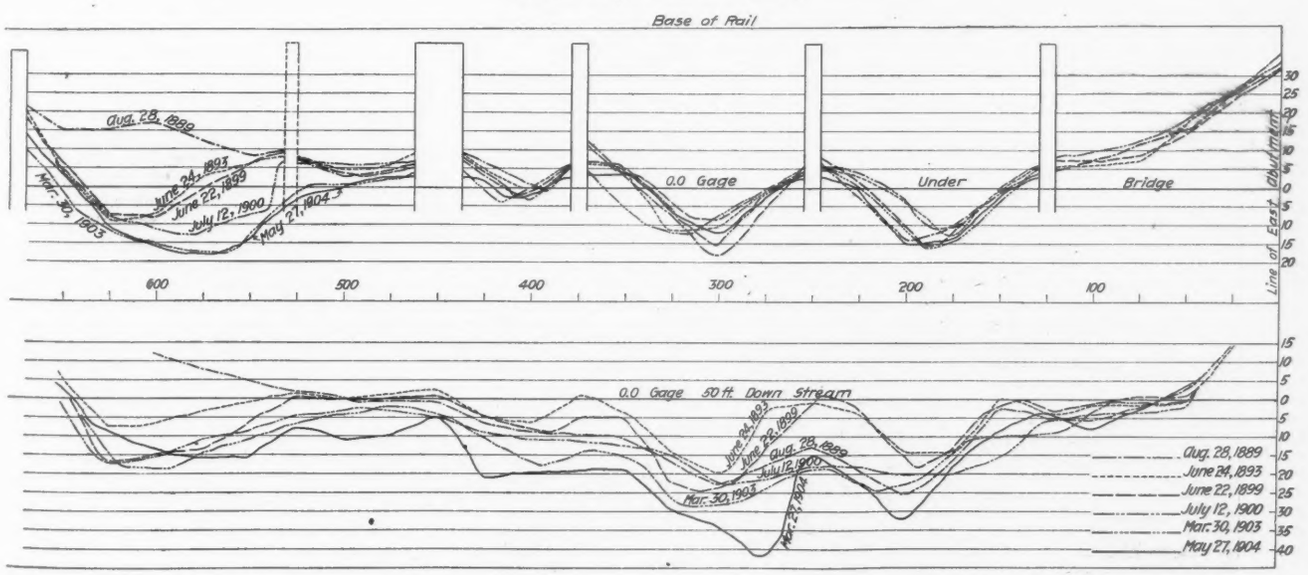
The new piers are completed and the superstructure, shown in broken lines in the drawing, is being erected. It should be explained that this drawing has the vertical scale double the horizontal scale, which accounts for the distorted appearance of the spans. The old spans are being taken out and the new ones erected upon falsework.

The contracts for the substructure and the superstructure were let to the Foundation Company, New York, and the King Bridge Company, Cleveland, respectively. The Pittsburg Construction Company is doing the erecting for the latter company. Mr. C. B. Clark, Assistant Engineer of the Big Four, has charge of the work under


WEST
EAST
Proposed Span 194'0" C. to C.
Proposed Base of Rail Grade 0.4%
Present
Level
Clear Line of Span El. 38.6
Present Clear Line of Span El. 39.4
High Water El. 27.3
High Water March 27, 1904 25.2'
Water Oct. 11, '02 El. 5.5
Low Water El. 0.0
Bot. of Rip July 12, 1900
Base Levels Low Water. River Flows from North to South.

Elevation of Terre Haute Bridge, Showing Old and New Spans.

(Broken lines indicate new spans.)



Profiles of Wabash River at Big Four Bridge, Terre Haute, Showing Effect of Scouring.

the direction of Mr. Geo. W. Kittredge, Chief Engineer, to whom and Mr. L. S. Rose, Engineer Maintenance of Way, we are indebted for data.

Railroad Shop Tools.*

(*Continued.*)

SLOTTING MACHINES.

Slotting machines are a necessity in every railroad shop, and as a rule the work which they are called upon to do, such as roughing and finishing locomotive driving boxes, slotting out connecting rods, locomotive side frames, etc., is unusually heavy; therefore these machines must be designed to withstand severe strains, and in consequence they appear massive. Slotting machines are of both the crank and geared type. The heavier machines are usually of the geared type and all designs of this machine should be provided with a quick return motion for the cutter bar or ram and with rotary, transverse and longitudinal automatic feeds for the work table. Special designs of slotting machines are also made, such as the double or triple head machines. These are principally used for slotting out locomotive side frames and work of like nature. There is also a traveling head slotting machine made. This is a useful tool in many cases, especially when the work is large and heavy and projects over the sides of the table and has to be blocked up. In cases of this kind the work is allowed to remain stationary and the tool is fed up to it, and thus all danger of throwing the work out of alinement is obviated.

*In the last instalment of this series of articles the captions of Figs. 2 and 4 were transposed. The Cincinnati double traveling head shaper with pull cut head was shown as the Niles-Bement-Pond double traveling head shaper, and vice versa.

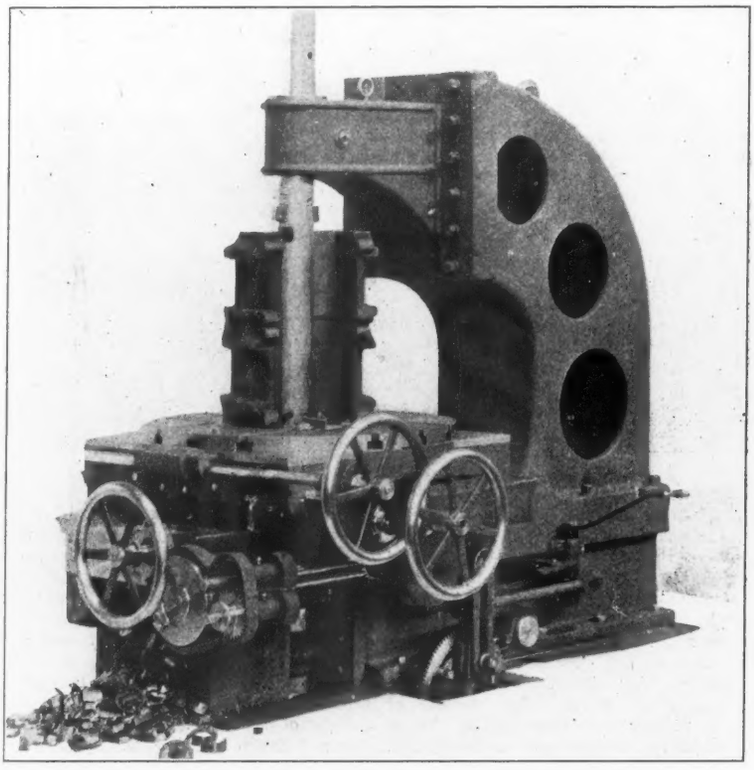


Fig. 2—Baker Bros. Draw-Stroke Slotter.

The 10-in. stroke back-geared slotter shown in Fig. 1 is made by the New Haven Manufacturing Company, New Haven, Conn. This machine has four changes of speed. The circular table is 30 in. in diameter and has automatic power feeds in all directions. It has a lateral movement of 25 in., a transverse travel of 18 in., and is also provided with an oil channel around the outer edge, and can be rigidly secured to the saddle at any point in its circumference. The cutter bar has a stroke of 10 in., and cuts to the center of 57 in.; the distance from the face of the tool block to the inside of the frame is 27 in.; the distance from the top of the table to the bottom of the ram when at at its highest point is 21½ in.; the distance from the top of the table to the bottom of the ram slide is 17 in. The bar is easily adjustable by means of a crank. It is counterbalanced, and has the Whitworth quick return motion; the tool block has a relief motion for the cutting tool, and is arranged with straps and studs for holding the tool. This machine is furnished with overhead countershaft, pulleys, hangers, self-oiling boxes, wrenches, etc. The cone pulleys have two steps for a 4-in. belt, and the driving pulleys on the countershaft are 18 in. in diameter, and 5-in. face, and should run about 180 revolutions per minute. The height of the frame is 6¾ ft., and the weight of the machine is about 5,700 lbs.

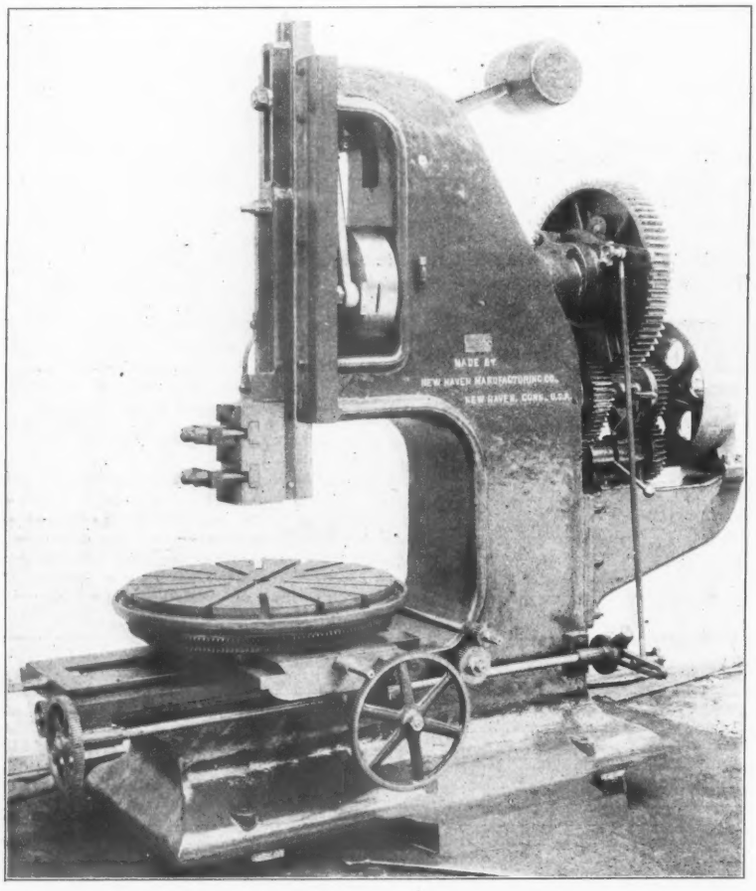


Fig. 1—The New Haven Back-Geared Slotter.

Fig. 2 shows the 30-in. draw-stroke slotter made by Baker Brothers, Toledo, Ohio. This is an extra heavy machine and was primarily designed for machining steel locomotive driving boxes, but it is also adapted to a great variety of other slotting where a great amount of metal is to be removed, or in long, deep holes which the regular design of slotter cannot reach. It is also useful for keyseating, and other work of like nature. The working table is 38½ in. in diameter and has a 20-in. hole in the center. The distance from the floor to the top of the table is 32 in. Full automatic feeds are provided in all directions and these, as well as the heads, can be engaged by the operator from his position in front of the machine. The length of the feed is adjustable from the right side of the machine. The ram is

counterbalanced and is rack and pinion driven through a heavy train of gearing. The reverse is accomplished by means of wide shifting belts, which shift freely. The tool bar can be of any shape or size up to and including 4½ in. in diameter. It is extremely rigid, as one end is clamped in a long bearing in the driving ram and the other end is supported by a bushing in the lower table directly below the work, and also by a bushing in the upper arm directly above the work. The tool relief on the return stroke is secured by means of a clapper box in the cutter bar. In the largest size cutter bar the tool used is of 2x1-in. bar stock. The knee support for the cutter bar can be removed and a regular round column, provided with an adjustable upper arm, can be substituted. The distance from the center of the cutter to the knee support is 35¼ in., and the distance from the center of the cutter to the round column, when used, is 44½ in. The machine is provided with a wide range of feeds and its weight is about 16,000 lbs. The following tests which were made on a slotter of this design will give some idea of its strength and capacity: A steel driving box was slotted out in a circle 11¾ in. in diameter and with a cut 11½ in. long. A roughing and a finishing cut were taken off all surfaces, including the corners, in 28 minutes. The roughing cut was ⅝ in. deep with a ¼-in. feed, and the machine made 15 cutting strokes per minute. After the test 15 chips from the roughing cut were picked up at random and were found to weigh 4 lbs. Another cut ¾ in. deep with ⅛-in. feed was taken on the same box. The cut was 11½ in. long, and in 15 minutes the metal was removed for 22 in. around the circle.

The 42-in. slotting machine shown in Fig. 3, is made by William Sellers & Co. The maximum distance from the face of the tool to the face of frame is 21 in. The stroke is adjustable from 0 to 10½ in. The machine has a uniform cutting speed and quick return. The table is 28 in. in diameter and has a transverse and longitudinal adjustment of 20 in. It also has a rotary adjustment and is supplied with variable self-feed. The distance from the floor to the top of the table is 32½ in. and the maximum height from the table to the under side of the frame is 13½ in. The bar slide is adjustable and its height can be readily changed to suit the work. The tool bar is counterbalanced and the length of stroke is adjusted by shifting the crank pin by means of a crank and screw. The feed acts when the bar is at the top of its stroke, thus obviating the dragging of the tool over the newly cut surface.

(To be continued.)

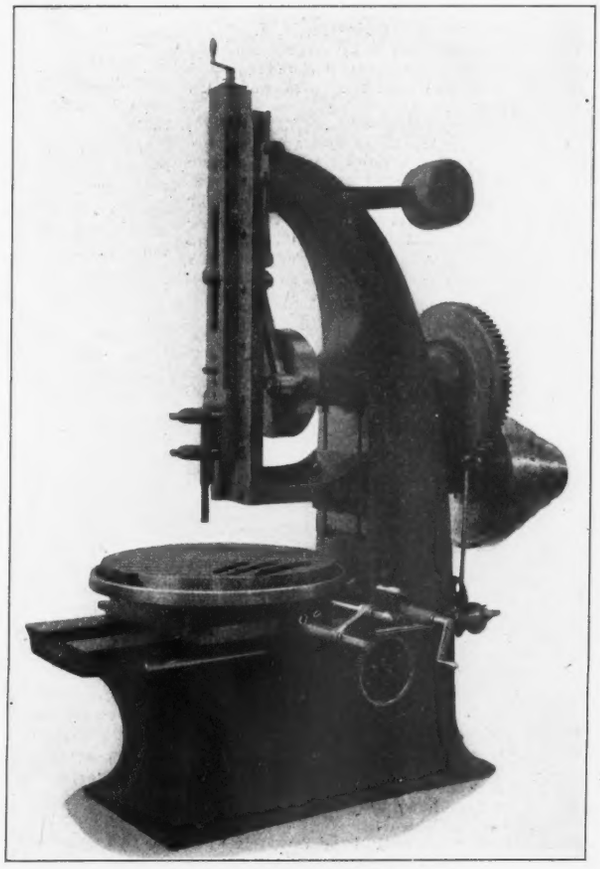


Fig. 3—The Sellers Slotter.

The Saxon State Railroad management requested its surgeons to lecture the employees on the abuse of alcoholic drinks. This practice has now been taken up in Wurtemberg and Alsace-Lorraine.

Train Accidents in the United States in December.[1]

rc, 1st, Baltimore & Ohio, Fairpoint, Ohio, a freight train, unexpectedly stopped, was run into by a following freight, wrecking the engine and several cars. Two trainmen were killed and one injured.

bc, 1st, Chicago, Rock Island & Pacific, Peabody, Kan., butting collision of freight trains, wrecking both engines and several cars. One engineman and two tramps were killed.

bc, 1st, 9 p. m., Southern Railway, East Durham, N. C., butting collision between a freight train and an empty passenger train; two trainmen injured, one probably fatally.

bc, 1st, Southern Railway, Stokesland, Va., butting collision between a passenger train and a freight, due, it is said, to a misunderstanding of despatcher's orders. One trainman was killed and four others were injured, one of them fatally.

xc, 1st, Delaware & Hudson, Oneonta, N. Y., a westbound freight train running at high speed collided with a freight which was entering a side track. One engine and many cars were wrecked and three trainmen were injured.

bc, 2d, Pennsylvania Lines West of Pittsburg, Columbus, Ind., passenger train No. 27 collided with a work train; and one engineman, two firemen and one brakeman were killed.

xc, 3d, Cleveland, Cincinnati, Chicago & St. Louis, Weisburg, Ind., a gravel train moving westward broke in two and the rear portion afterward ran into the forward one, wrecking 15 cars and destroying a bridge. One brakeman was injured.

dr, 3d, Missouri Pacific, Holden, Mo., a passenger train was derailed by a loose or defective rail and three passenger cars fell down a bank, one of them lodging in a stream of water. Forty passengers were injured, one of them fatally.

unx, 3d, Pennsylvania road, Middletown, Pa., a car in a freight train was derailed and with several other cars was wrecked. Two tramps were killed and a third was injured.

bc, 5th, 4 a.m., Chesapeake & Ohio, Maysville, Ky., freight train No. 98 ran over a misplaced switch and into the head of a freight standing on the side track, wrecking three engines and badly damaging several cars. One employee was killed and another fatally injured. It is said that the switch was misplaced by a brakeman belonging to the train standing in the side track, who turned the switch for the siding on the mistaken assumption that his train was to proceed to the next station to meet No. 98.

bc, 5th, Mobile & Ohio, Tuscaloosa, Ala., butting collision between a passenger train and a work train, badly damaging both engines. Two employees were injured.

unx, 5th, St. Louis & San Francisco, Blue Springs, Miss., a car in a freight train was derailed, and, with several other cars, ran on the ties of a trestle bridge; and after running some distance broke through the trestle. Two passengers and several trainmen were injured.

xc, 5th, Chicago, Rock Island & Pacific, Clio, Iowa, passenger train No. 12 ran over a misplaced switch and collided with some freight cars. The engine and mail car were overturned and the engineman and fireman were scalded, probably fatally.

bc, 9th, 8 p.m., Chicago, Rock Island & Pacific, Omlee, N. M., a southbound freight train ran into a misplaced switch and into the head of a northbound freight standing on the side track. One engineman and one fireman were injured.

bc, 10th, 11 p.m., New York, Chicago & St. Louis, Dunkirk, N. Y., butting collision of freight trains, wrecking both engines and six cars. Two trainmen were killed. One of the trains had disregarded a telegraphic order requiring it to wait at a certain station for the other.

*rc, 11th, 2 a.m., Delaware, Lackawanna & Western, Bath, N. Y., rear collision of freight trains, wrecking caboose and several cars. The wreck took fire and the conductor and flagman riding in the caboose of the leading train were burned to death.

rc, 12th, Long Island road, Central Islip, N. Y., a snow plow ran into the rear of a preceding snow plow train, and five employees were injured.

bc, 12th, Pittsburg, Cincinnati, Chicago & St. Louis, Spring Valley, Ohio, butting collision between a special train carrying officers of the road and a freight train. Both trains were running at speed and both engines, one baggage car and two freight cars were wrecked. The boiler of the freight engine exploded within a few seconds after the collision. Six trainmen and two of the occupants of the special train were injured. The officers' train was running as the second section of train No. 19 and the men in charge of the freight failed to observe the green signals on the first section.

*dr, 12th, Pennsylvania Lines, Coshocton, Ohio, a mixed train was derailed by a broken rail and the caboose fell down a bank, caught fire from the stove inside and was burnt up. Three trainmen and two passengers were injured.

unx, 12th, St. Louis & San Francisco, Tupelo, Miss., a wrecking train consisting of an engine and five cars was derailed, and the engineman was killed. Two other trainmen were injured.

rc, 13th, Cleveland, Cincinnati, Chicago & St. Louis, Shelby, Ohio, rear collision of

[1]Accidents in which injuries are few or slight and the money loss is apparently small, will as a rule be omitted from this list. The official accident record published by the Interstate Commerce Commission quarterly is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Derailments; defect of roadway.
eq	Derailments; defect of equipment.
dn	Derailments; negligence in operating.
unf	Derailments; unforeseen obstruction.
unx	Derailments; unexplained.
o	Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

freight trains, killing one man and injuring another.

bc, 13th, New York, Susquehanna & Western, Franklin Furnace, N. J., butting collision between a passenger train and an empty engine. Three trainmen and two passengers were injured.

xc, 13th, Chicago, Milwaukee & St. Paul, La Crosse, Wis., collision of switching trains, wrecking both engines and several cars. One engineman was killed and two other trainmen were injured, probably fatally.

dn, 13th, Atlantic Coast Line, Warsaw, N. C., passenger train No. 41 while running at high speed was derailed at a misplaced switch and the engine and first two cars were wrecked. The engineman and fireman were killed and a postal clerk was injured.

xc, 14th, Janesville, Wis., collision between passenger trains of the Chicago, Milwaukee & St. Paul and Chicago & North-Western, wrecking one tender and one baggage car. Two trainmen were injured.

xc, 14th, Manhattan, Kan., a freight train of the Chicago, Rock Island & Pacific collided with a freight of the Union Pacific at the crossing of the two roads, and the engineman, fireman, two other trainmen and a drover were injured. It is said that the Rock Island engineman was asleep.

dr, 15th, 1 a.m., Chicago, Burlington & Quincy, Bristol, Ill., eastbound fast mail train No. 8 was derailed while running at high speed and two mail cars were wrecked. The fireman was killed and two trainmen and four mail clerks were injured. It is believed that the derailment was due to a broken rail.

bc, 16th, Ohio River Bridge, Jeffersonville, Ind., collision between a passenger train and a switching engine; one mail clerk and one fireman fatally injured.

bc, 18th, Lake Erie & Western, Bloomington, Ill., butting collision of freight trains, damaging three engines and several cars. One engineman and three trainmen were injured, the engineman fatally.

unx, 18th, Atlantic Coast Line, Ariosto, Ala., a freight train was derailed and the engine and 15 cars were wrecked. One brakeman was killed.

rc, 19th, 5 a.m., Western & Atlantic, Calhoun, Ga., a freight train ran into the rear of a preceding freight, ditching one engine and four cars; engineman and fireman injured, the former fatally.

xc, 19th, 3 a.m., Central of Georgia, Fort McPherson, Ga., butting collision of switching engines on a side track; four employees injured.

xc, 19th, 7:35 p.m., Pennsylvania road, West Philadelphia, Pa., an eastbound local passenger train ran over a misplaced switch and into the side of the westbound Chicago Limited express, wrecking two sleeping cars; three passengers were injured. The misplaced switch, which was connected with an interlocking tower, had been undergoing repairs and its derangement appears to have been due to some error on the part of the repairman.

dn, 19th, 5 a.m., Great Northern, Hinton, Iowa, a freight train was derailed at a derailing switch approaching the Illinois Central and the engine and 14 cars were wrecked, the engine being overturned. The engineman and fireman were killed and one brakeman was injured. The signal tower was wrecked and the signalman narrowly escaped with his life, being knocked unconscious. This signalman, according to the published reports, is only 18 years old, and had worked at this place only three days, having been before that an employee of the Western Union Telegraph Company in Chicago.

unx, 19th, Chesapeake & Nashville, Gallatin, Tenn., a freight train was derailed and the engine was overturned. The engineman was seriously injured.

o, 19th, Chicago, Rock Island & Pacific, Davenport, Iowa, the locomotive of a freight train was wrecked by the explosion of its boiler; engineman and fireman killed and four other trainmen injured.

bc, 20th, Buffalo, Rochester & Pittsburg, West Falls, N. Y., butting collision of freight trains, each drawn by two engines. One brakeman and one fireman were killed and another fireman was badly scalded. All four engines and many cars were wrecked. A mistake in telegraphic orders is said to have been the cause of the collision.

dr, 20th, Chicago, Milwaukee & St. Paul, Lena, Wis., a passenger train was derailed by a broken rail and the engine and two cars were ditched. The engineman and fireman were killed and 15 persons were injured.

*†unx, 21st, Southern Railway, Somerset, Va., a northbound passenger train was derailed; one passenger killed and five passengers and one trainman injured. A sleeping car took fire and was burnt up.

bc, 22d, Chicago, Rock Island & Pacific, Houston, Ark., butting collision between train No. 56 and a work train; one brakeman killed and two other trainmen injured. It is said that No. 56 attempted to "smoke in," instead of following the rules.

bc, 22d, Atlantic Coast Line, Ariosto, Ala., butting collision between a freight train and a work train; one trainman killed, four injured.

dr, 22d, Erie road, Overbrook, N. J., a passenger train consisting of an engine and two cars was derailed and seven passengers were injured. It is said that the track had been made unstable by frost.

xc, 23d, Kansas City Southern, Bloomberg, Tex., a freight train was derailed at a misplaced or defective switch and the engine fell down a bank. Three trainmen injured.

†*bc, 25th, 3 a.m., Southern Railway, near Maud, Ill., butting collision between eastbound passenger train No. 1 and westbound passenger train No. 2, wrecking both engines and several cars. The day cars in the westbound train took fire and were somewhat burnt. Two passengers and five employees were killed, and six passengers and six employees were injured. The collision was due to the failure of the operator at Browns to deliver an order to the eastbound train. The operator claims that his signal was pulled by an outside party.

rc, 26th, Boston & Albany, Westfield, Mass., an eastbound passenger train ran into the rear of a preceding freight train which had been unexpectedly stopped, and the engine fell down a bank. The engineman was injured.

bc, 27th, 9 p.m., Wabash road, Fort Wayne, Ind., butting collision between an eastbound passenger train and a westbound freight, wrecking both engines and several cars. The engineman of the freight was killed and seven other trainmen and four passengers were injured. The freight had run beyond the switch where it should have waited for the passenger.

xc, 27th, Chicago Great Western, Melbourne, Iowa, a freight train ascending a grade in a snowstorm became stalled and a part of the cars were detached and taken forward to Melbourne station; the engine, on returning, collided violently with the remaining cars and, with four of them, was wrecked. Six trainmen were injured.

xc, 27th, Philadelphia, Baltimore & Washington, Baltimore, Md., collision between a passenger train of the Northern Central and some empty passenger cars being switched in the yard. Five employees were injured.

xc, 27th, 7 p.m., New York, New Haven & Hartford, Stamford, Conn., a westbound local passenger train was run into at the rear by a following express train, damaging one car. One employee was killed and one passenger was injured. There was a dense fog at the time and it appears that the engineman of the express ran past a distant and a home signal set against him.

dr, 27th, Kansas City Southern, Horatio, Ark., a passenger train was derailed at a defective switch and the engine was overturned. The engineman and fireman were injured.

*rc, 28th, Baltimore & Ohio, Sherwood, Ohio, a westbound passenger train ran over a misplaced switch and into the rear of a freight train standing on the side track. The passenger engine was overturned and the baggage car, express car and several freight cars were wrecked and burnt up. The engineman and fireman were fatally scalded.

bc, 29th, Hecla & Torch Lake road, Calumet, Mich., butting collision of work trains; one engineman killed, one fireman injured.

bc, 30th, Chicago, Rock Island & Pacific, Fort Reno, Okla., butting collision between a westbound passenger train and an eastbound freight, wrecking both engines and many cars. One engineman was killed and one fireman and several passengers were injured.

eq, 30th, Chicago, Burlington & Quincy, Russell, Iowa, a freight train was derailed by a broken wheel and many cars were wrecked. Three employees were injured.

xc, 31st, Suisun, Cal., passenger train No. 11 ran over a misplaced switch and collided with the engine of a gravel train standing on the side track. The engineman of the passenger train was killed and both engines and five cars were wrecked.

Car Cleaning Rules of Kentucky State Board of Health.

Rule 21.—All day coaches engaged in regular traffic shall be thoroughly cleaned after each trip at such points as facilities for the same have been provided. In no case shall such cleansing be less frequently performed than on every third day of use. In such cleansing, all rugs, mattings and upholstered seats and back seats, when practicable, shall be removed from the coach to the open air for mechanical cleansing, and be exposed to sunlight when the prevailing meteorological conditions will permit.

22.—All interior surfaces in coaches are to be mopped, scrubbed or cleansed at intervals of not more than ten days with solutions of mercury bichloride, tricreosol, or other disinfecting preparation preferred by any corporation, and approved by this board as to ingredients and strength.

23.—Spittoons are to be provided in number or not less than one for each seat in all smoking cars and toilet rooms, and one at each end of all day coaches, and in all waiting rooms. Placards shall be displayed at each end of all such coaches, and in all waiting rooms, indicating the importance of using the spittoons, and it shall be unlawful for any person to spit upon the floor, or platform of any railroad car, or other public conveyance, or upon the floor of any waiting room or platform in any station or depot.

24.—All coaches of any kind in which an acute infectious disease has been carried shall remain closed and unoccupied after such person has been removed until it has been thoroughly cleansed and disinfected by the use of formaldehyde gas in quantities of not less than 40 fluid ounces of formalin to each coach. All day coaches in regular use for through travel are to be disinfected after cleansing, by some method approved by this board, at intervals of not more than ten days.

25.—All toilet rooms, spittoons, water closets, urinals and toilet appliances in cars are to be scrubbed with soap and hot water and disinfected with formalin or other approved method after each trip's use and kept as clean as possible on the road; and all similar rooms and appliances in stations shall be cleaned daily in the same way; and where vaults or surface receptacles are used in stations these shall be disinfected daily with fresh lime.

26.—All preceding regulations in regard to cleanliness and disinfection shall apply equally to sleeping, dining, buffet and parlor cars used in the service of the public.

27.—All blankets, curtains and hangings used in sleeping cars shall be exposed to super-heated steam, or other means of disinfection approved by this board, at intervals of not more than ten days, and all mattresses shall be so treated at intervals of not more than 60 days.

GENERAL NEWS SECTION

THE SCRAP HEAP.

Railway Appliance Exhibition.

As already noted, the bill authorizing the use of the Monument Grounds at Washington as a site for the exhibition of railroad appliances in connection with the International Railway Congress finally passed the House of Representatives Jan. 9. It was signed by President Roosevelt Jan. 14. The Committee of Arrangements is now preparing and will distribute within a few days a circular inviting membership and applications for exhibit space in the American Railway Appliance Exhibition together with a copy of the rules and regulations to govern exhibitors.

Simplex Railway Appliance Co.

Announcement was made this week that the Simplex Railway Appliance Company, of Hammond, Ind., had been taken over by the American Steel Foundries. The organization of the Simplex Company is to remain intact, the only change being in the ownership.

Steam Engine Exhibition in New York City.

The Manufacturers' Steam Engine and Appliance Exhibition Co. announces that it will hold an exhibition in Madison Square Garden, New York, May 22 to 27, and invites makers of steam engines and steam appliances to take space. William H. Curtis is Secretary, and will have his office in Madison Square Garden.

Discrimination in Furnishing Cars.

In the case of the Paxton Tie Company against the Detroit Southern, the Interstate Commerce Commission in an opinion by Commissioner Fifer finds that between Dec. 16, 1902, and April 6, 1903, this carrier unjustly discriminated against complainant in furnishing cars for the shipment of cross ties by refusing to provide any cars for such shipments by complainant, while it did furnish cars to other persons for the interstate shipment of lumber, stone and many other articles, and also supplied cars for the shipment of cross ties destined almost entirely for its own use. Reparation in the sum of $630 is awarded to the complainant by the Commission.

Unambiguous Language.

Elmer St. John, of this city, has been appointed a member of the lobbying committee of the Brotherhood of Railway Trainmen, to attend the sessions of the legislature to look after legislation affecting the interests of the brotherhood. Mr. St. John returned last night from Indianapolis, where he attended a meeting composed of 15 representatives of different lodges called for the purpose of taking steps to safeguard the railroad men's interest in the general assembly. The meeting appointed a committee consisting of Mr. St. John, F. L. Seick, of Garrett, and J. L. Service, of Terre Haute. These gentlemen will remain in Indianapolis during the entire legislative session.—*Fort Wayne Gazette.*

The Hepburn Bill.

Chairman Hepburn, of the House Committee on Commerce, introduced in Congress last Saturday a bill to abolish the Interstate Commerce Commission and to provide for the appointment of another to consist of nine members, each to receive $10,000 a year; also, for the establishment of a Court of Commerce to be composed of five of the Circuit Judges of the United States. Whenever the Commission, on complaint and hearing, shall have declared what is a reasonable rate of transportation, the said rate shall of its own force take effect on 60 days' notice to the carrier. Such rates may be reviewed by the Court of Commerce, which court may suspend an unreasonable rate pending review; but only providing the carrier give a bond to protect aggrieved shippers. When a joint rate ordered is not divided by the carriers, the Commission may, after 20 days, fix the divisions. Appeals to the Supreme Court of the United States shall not operate as a stay to orders of the Court of Commerce unless a bond is given to cover excessive tolls collected pending the appeal.

Congressman Esch, of Wisconsin, has introduced a bill to empower the Interstate Commerce Commission to prescribe freight rates, and Congressman Townsend, of Michigan, one to create a court of transportation. Representative Davey, of Louisiana, has also introduced a railroad bill.

Annual Dinner of the American Institute of Electrical Engineers.

Preparations for the annual dinner of the American Institute of Electrical Engineers are being actively pushed, and the affair promises to be a great success. It will be devoted to signalizing the triumphs of electric traction. President Lieb has appointed the following committee, which is already at work: T. C. Martin, Chairman; W. C. Gotshall, L. B. Stillwell, H. G. Stott, Calvin W. Rice, F. C. Bates, H. W. Blake, P. G. Gossler, E. B. Katte, C. W. Price, W. A. Pearson and W. L. Conwell. This committee has organized, and sub-committees are at work on different features of the banquet. Some original and novel features will be included, and it is believed that the oratory will be unusually interesting. Messrs. Frank J. Sprague and Leo Daft are to speak for the Institute pioneers in this great field of electrical development. The banquet will be held at New York in the grand ball room of the Waldorf-Astoria on Feb. 8, and it is expected that between 400 and 500 will be present, including many ladies. Tickets are $5 each, exclusive of wine. In addition to the features connected with the dinner itself, there will be exhibited, for the first time, the beautiful oil painting just presented by the British Institute of Electrical Engineers, as a souvenir of last year's visit to the Institute, representing Dr. Gilbert making magnetic experiments before Queen Elizabeth. The bust of Prof. Ferraris, also presented to the Institute last year, will be exhibited in the Astor Gallery reception room.

Live Stock vs. "Dead" Freight.

The Interstate Commerce Commission in an opinion by Commissioner Fifer has announced its decision in the case of the Chicago Live Stock Exchange against the Chicago Great Western and other carriers. The carriers exact higher rates for transporting cattle and hogs than for the transportation of live stock products. The Commission holds that such discrimination is not justified by difference in the cost of transportation, and is not otherwise justified, and therefore subjects the traffic in live stock and the Chicago live-stock market and those interested therein, including complaintant, to unreasonable disadvantage, and gives to the traffic in the products of live stock unreasonable preference. The Commission reaffirms its previous decision in the Chicago Board of Trade case and extends the principle therein announced to the transportation of cattle and their products. The desire of a carrier to secure additional business does not justify a change in the relation of rates resulting in a higher rate upon cattle and hogs, the raw material, than upon live stock products, the manufactured article, where, as in this case, the articles are in sharp competition with each other in markets of purchase and sale, where it appears that upon other lines and in other sections rates are generally no higher, and in many instances much lower, on the traffic prejudiced than on that favored by the change, and where numerous and important industries, which have been built up and maintained under the former adjustment, and those interested in such industries will be injuriously affected by the action taken.

P. R. R. Brakemen and Yardmen.

The Pennsylvania Railroad has increased the wages of yard trainmen at and near its New York terminus, as a result of protracted conferences with the officers of the Brakemen's Brotherhood. This question, and the demands of the brakemen to be relieved from helping firemen on heavy freight trains between Harrisburg and Altoona, have been the subject of the negotiations which have been the basis of columns of gossip in the daily papers during the past ten days. It appears that for a long time the forward-end brakeman of heavy freight trains has assisted in firing for short distances on the Middle Division. When, a few months ago, the company reduced the number of brakemen, in consequence of the increasing use of the air-brake, the Brotherhood took occasion to demand increased pay on account of the firing, and some little disturbance on this account was reported some months ago. Controversy over the matter appears now to have ceased, but whether or not the brakemen are effectually quieted depends on action yet to be taken by the road, as appears by a statement issued at Philadelphia, which, according to the despatches, is given out on the joint authority of General Manager Atterbury of the road, and Grand Master Morrissey, of the Brotherhood of Railroad Trainmen.

"Mr. Atterbury has accepted Mr. Morrissey's proposition on the Jersey City situation, increasing the wages of the conductors and brakemen in Jersey City, Harsimus Cove, Greenville, Meadows, Newark and Waverly yards to the standard rates of New York Harbor, together with other working conditions.

"Mr. Morrissey has accepted Mr. Atterbury's proposition in regard to brakemen assisting the firemen.

"Mr. Atterbury will take and put into effect within a reasonable time such other measures of relief, not only to the brakemen, but also to the firemen, as have been discussed and offered by Mr. Atterbury and suggested by the committee."

The concessions granted to the trainmen mean a considerable increase in wages and better pay for overtime. Day conductors will receive an increase of 90 cents a month: night conductors $3.30 a month; day brakemen, $6.60, and night brakemen, $9.30. Pay is guaranteed for a minimum day of ten hours. Brakemen on trains, assisting firemen, will be paid firemen's rate of pay for the hours spent in firing, and

the time they are thus employed will be credited to their seniority records, by which promotions are made from brakeman to fireman. The company will place additional men at ash pits and water tanks.

An Automatic Spacing Table.

A useful machine for locomotive and car shops, boiler shops, bridge shops, and, in fact, any shop where long pieces of sheet metal are to be punched with a number of holes in one line, is the automatic spacing table shown herewith. The bed is of the solid-casting type to insure the most economical distribution of metal for weight and strength. The bed is made sufficiently thick to insure good lateral support, and counteract the twisting tendency which occurs at certain times when the machine is shearing bars or angles. This stiffening is assisted by ribs placed back of the throat. Inequalities of shrinkage are guarded against and all corners are well filleted to prevent cracks and assist the flow of metal. The solid frame also enables any defects in a casting to be more readily detected in the rough.

The automatic clutch is cast steel with a cast-iron cam ring, which can be adjusted so as to stop the cam shaft at any part of its revolution. The gear and pinion are cast-iron made from metal patterns previously planed on a gear planer, giving smooth, well-formed teeth and quiet running.

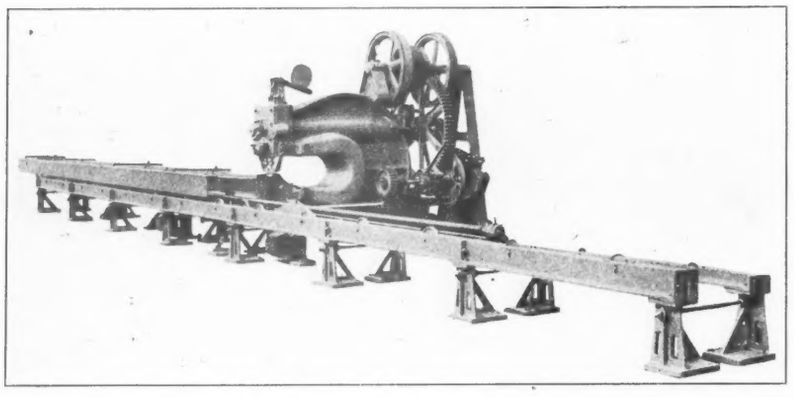
The plunger of the punch is fitted with a double gag mechanism, adjustable forward and backward, and so arranged that only one gag can be in operation at one time, or both can be out at one time. The plunger also is equipped with a new swinging pintle of cast steel with bronze bushing. The die block is cast steel of the universal type. These blocks are so made that beams and channels ranging from 4 in. up can be punched. The machine has a safety capstan with a ratchet, which will hold only in the positive direction and prevents the capstan bar from coming down upon the operator if he puts his foot on the treadle with the bar in place. The machine is also equipped with a new side stripper instead of the old style throat stripper.

The motion for the automatic spacing table is derived from the main crank-shaft at the back end, at which point there is keyed to the cam shaft a crank with adjustable throw. The motion is transmitted through a pawl and ratchet, spur gears and bevel gears to the screw, which gives the travel to the table. These gears are all cut gears, rigidly fastened to the frame of the punch bed. The return motion, operated by a friction clutch, is also driven from the cam shaft by a chain.

The table is built up of structural shapes. It is 31 ft. long and 30 in. wide, and is very rigid and light, both qualities being essential to satisfactory operation of the machine. This table will handle angles from 2½ in. up to 10 in., and channels and beams up to 15 in., being supported on specially designed blocks bolted to the side of the table. The spacing in these pieces can be varied by $^1/_{16}$ in. from $^1/_{16}$ in. to 4¼ in., with perfect accuracy. In the length of 31 ft., there will be 90, 4 in. spacings which will measure exactly 30 ft. from center to center of end holes. The table is carried on rollers, the inside ones being V-shaped, to guide the table. The travel of the table either side of the center line of the punch is 31 ft. The total length of runway is 49 ft., allowing the table to overhang a little less than one-third of its length in the extreme positions.

The screw is machinery steel, 2-in. pitch, Acme double threads. It is supported in babbitted bearings at each end and at two intermediate points, the latter automatically clearing the nut as it passes over them. Absence of spring in the screw avoids variation in the spacing. The nut is bronze and is babbitted into a cast-iron casing firmly bolted to the table at its middle. The bearings carrying the screw and auxiliary driving shaft are braced across the runways from underneath. These runways rest on cast-iron stands tied together with rods and bolted to a concrete foundation.

The Cleveland Punch & Shear Works Company, Cleveland, Ohio, is the builder. The Middletown Car Works, Middletown, Pa., and the Louisville & Nashville shops, Louisville, Ky., have each been shipped one of the machines.



An Automatic Spacing Table.

Vacuum Sweeping at Jersey City.

The Central of New Jersey has put in at its Jersey City terminal a plant for vacuum car cleaning, the yard being piped with 3,600 ft. of pipe, by means of which, and a suitable suction apparatus, passenger cars are cleaned in any part of the cleaning yard. The pipes are from 2 in. to 5 in. in diameter. At short intervals this pipe is tapped and from these cocks is run the flexible hose, which may be taken into the car either by door or window. At the foot of the hose is a metal pipe with a flat triangular end, along the base of which is an opening and through which the dust is drawn by the Vacuum or "drawing-in machine" located a distance away. The operator runs the slot opening over the cushions, carpets, curtains, wood-work, etc., and without any commotion or dust raising, every loose particle or germ is whisked away. The dust thus removed, before reaching the great "drawing-in machine" must pass through two dust separators, the first of which clears the air of 90 per cent. of the grit, dust and germs; the second separator or cylinder draws the air through water containing corrosive sublimate, and completes the purification. Two cars can be thoroughly cleaned at the same expense of time and money as was formerly consumed in cleaning one.

The Grafstrom Memorial Fund.

Mr. S. P. Bush, Treasurer of the fund raised as a memorial to Mr. Edward Grafstrom, drowned at Topeka, Kan., June 2, 1903, while engaged in rescuing others from the great flood, announces that the sum finally received amounted to $5,500. Mr. W. H. Miner, the originator of the movement to raise this fund, and the Treasurer, after due consultation with contributors and others, have decided that the best disposition to make of the fund would be to invest it safely for Mrs. Grafstom. Illinois Central Railroad stock was accordingly bought, and is now in her possession. The Treasurer expresses his thanks to all of the contributors for their generous co-operation.

Air-Brake Practice and Defective Couplers.*

The report of our inspectors show that the provisions of the air-brake law are generally well observed so far as the proportion of air-brake cars in service is concerned. In many instances, however, these cars do not receive the attention they should, and are permitted to run in such ineffective condition as to be really inoperative so far as the brakes are concerned. Leaky train pipes and improper piston travel in brake cylinders are the most frequent complaints, and in nearly every instance where these complaints are common it is found to be due to insufficient repair force at points where cars are inspected and repaired. In many cases engineers complain that they cannot pump sufficient air to enable them to control their trains entirely by air brakes, and they have no confidence in their ability to control their trains. They thus insist that trains shall be controlled by hand brakes in all dangerous places, holding the air in reserve for use in emergencies only. It is found that generally where such conditions exist they are due to causes which may be easily remedied, such as leaky train lines, dirty and inoperative triple valves, and improper piston travel, all due to imperfect inspection and care of brakes, or air pumps not of sufficient capacity to furnish air for the number of brakes used. Another reason is failure of the roads to properly educate their employees in the use of air brakes.

It has been found that in many cases where trains were run without the required 50 per cent. of air brakes in operation it was due entirely to the neglect of trainmen, who had positive orders to use 50 per cent. of air, but who did not take the trouble to couple the air together, thus placing their employers in the attitude of violators of the law.

Of the freight cars inspected more than 31 per cent. were found defective, many of these defects being of such nature as to require men to go between the cars to couple or uncouple them, thus placing their lives or limbs in danger and violating the spirit and letter of the law. But of 2,319 passenger cars inspected less than 2 per cent. were defective, and the defects on passenger cars were generally of a minor character and were immediately repaired. When the same attention that is now devoted to passenger equipment is also given to freight equipment the number of deaths and injuries will largely decrease.

It has been suggested that our inspectors designate cars which they find defective by marking or carding them as such. This might tend to a closer inspection on the part

*From the annual report of the Interstate Commerce Commission.

of the railway company's inspectors in some instances, and would to that extent lead to an improvement in equipment, but owing to the limited force of inspectors at the command of the commission, as compared with the vast amount of equipment to be inspected, the carding of defective cars could only amount to scratching the surface, and would have a tendency to shift the burden of responsibility for defective cars not marked by the commission's inspectors from the railroads to the government. The burden is now upon the railroads, and they employ car inspectors at various points to see that no cars are received from another road unless they are in good condition. At these interchange points a car that was carded by the government as defective would be sure to be rejected; but, on the other hand, a car that was not carded might be received, although it was clearly defective.

Federal Railway Signal Company

Mr. John T. Cade, the well-known signal engineer, has resigned his position with the General Railway Signal Company and is at the head of a new company with the above name which has just been organized. Its New York office is at 150 Nassau street, room 1,933, and the directors, beside Mr. Cade, are Lawrence Griffith, P. Gansford Ten Eyck, William W. Lavarack, and George L. Hall. Mr. Griffith, long connected with the Grand Central station, New York City, is Vice-President of the Railway Signal Association; Mr. Ten Eyck is Assistant Signal Engineer of the New York Central, and Mr. Lavarack was until recently Superintendent of the Rochester shops of the General Railway Signal Company. Mr. Hall is the "G. L. H. Rail-joint" man. The new company has been incorporated in New Jersey with a capital of $2,000,000; $500,000 preferred stock and $1,500,000 common. The company is to establish a manufactory and will make and install all kinds of switches, signals, interlockings and safety appliances generally.

Manufacturing and Business.

The Pullman Company has declared its regular quarterly dividend (No. 152) of $2 per share, payable February 15 to stockholders of record January 31.

The Block-Pollak Iron Co., Chicago, Ill., have opened a branch office in St. Louis, Mo., at 1610 Chemical Building. Mr. Louis S. Simon will have charge of the office.

The Canadian Northern has bought a Russell swing elevator snow plough, which, with wings opened, is 16 ft. wide. The plough weighs, without ballast, 70,000 lbs.

Mr. W. R. Toppan, who for some time has been Manager of the Railroad Department of the Kennicott Water Softener Co., Chicago, has been elected General Manager of that company.

The American Water Softening Co., it is reported, has just completed for the Toledo & Ohio Central, at Columbus, Ohio, a water softening plant having a daily capacity of 250,000 gallons.

The Northwestern Power Co., of Portland, has been incorporated in Maine with a capital of $10,000,000, with J. C. Wright as President, and C. M. Drummond, of Portland, Treasurer.

Bids will soon be asked by the Netherlands State Railways at Amsterdam, Holland, for the superstructure of a railroad bridge over the North Sea canal at Zaandan to cost about $293,000.

W. H. Barnard, formerly Chief Draftsman of the car department of the Chicago, Burlington & Quincy at Chicago, has been appointed Mechanical Engineer of the Barney & Smith Car Company, Dayton, Ohio.

The Goldschmidt Thermit Co., of New York, which received a grand prize at the St. Louis World's Fair, has, at the request of the United States Government, presented to the National Museum at Washington its entire St. Louis exhibit.

W. W. Rosser, formerly Sales Agent for the Washburn Company, Minneapolis, Minn., has been appointed Superintendent, with headquarters in Chicago, succeeding C. H. Burrows, appointed Mechanical Engineer, with headquarters in Minneapolis.

Fred F. Bennett, who severed his connection with the Acme Supply Co., Chicago, about a year ago, has returned to the employ of that company. The specialties of this concern include vestibule diaphragms, diaphragm attachments, vestibule side curtains and car furnishings.

The firm of A. L. Ide & Sons, Springfield, Ill., maker of steam engines, announce that it has opened a New York office at 11 Broadway. Mr. J. L. Robertson has been made manager of the office and he will attend to all of the company's export, New England and Middle States business.

Arthur M. Waitt, formerly of the New York Central & Hudson River Railroad, has opened an office at 17 Battery Place, New York City. Mr. Waitt will act as consulting engineer and will give special attention to all mechanical and electrical engineering matters appertaining to railroads.

Arthur P. Bowen, heretofore Sales Agent for the Brazil Block Coal Co., has been appointed Purchasing Agent of the Western Steel Car & Foundry Co. Clive Runnells, heretofore Commercial Agent of the Pere Marquette at Chicago, has been placed in charge of the sales department of the same company.

The Louisville & Nashville Railroad Company is equipping about two miles of its track through the paved streets of Mobile, Ala., with the Duggan track chair. These chairs are supplied by the Burnham & Duggan Railroad Appliance Company, Boston, Mass., and a detailed description of the chair was printed in the *Railroad Gazette*, Feb. 26, 1904.

Our notice of the initial appearance of "Steam Shovel News" (Jan. 13th) stated that the magazine is issued by The Vulcan Iron Works Co., Toledo, Ohio. We are informed by the publishers that, although devoting considerable space to Vulcan machinery, the publication is independent. The magazine was begun as a quarterly but it is expected to make it a monthly in the near future.

The Philadelphia Pneumatic Tool Co. of Pennsylvania has been incorporated in New Jersey with a capital of $1,000,000 to take over the business of the Philadelphia Pneumatic Tool Co. and to make and sell pneumatic tools. The incorporators are: Julius Keller, C. F. Binkley, C. S. Bell and M. D. Aber. The company is negotiating to buy land at Twenty-first street and Allegheny avenue, Philadelphia.

On the Pennsylvania Lines West of Pittsburg two additional water-softening plants are to be built, for which contracts have been let; and the contract for a third will be let shortly. The company now has in operation a Kennicott water softener at Unionville, 22 miles west of Columbus, with a capacity of 10,000 gallons per hour; one at Washington, 50 miles west of Crestline, and one at Middlepoint, 48 miles further west.

The equipment and paint inspection department of the Niagara Railway & Mill Supply Co., of Buffalo, N. Y., was incorporated last month as the Cooper Process Co. The officers are: President, H. T. Koerner; Vice-President, C. A. Criquel; Secretary, R. W. Koerner; Treasurer, N. S. Thomas; General Manager, G. M. Stowe, Jr., and General Superintendent, H. R. Cooper. The company will make and sell the Cooper preservative for use on steel cars and steel structures.

The Northern Engineering Works, maker of cranes, Detroit, Mich., report the following recent shipments and installations of electric and hand power cranes: Union Electric Co., Dubuque, one 15 ton; American Production Co., one 10 ton electric crane; Detroit Edison Co., Delray, Mich., one 30 ton alternating electric traveling crane; Edison Illuminating Co., 1 7½ ton crane; Union Brass & Foundry Co., Lowell; Kenton Marble Co., Kenton, Ohio, one eight ton traveling crane.

The Monarch Railway Supply Co., Detroit, Mich., Harry W. Frost, President, has just been organized. Arrangements have been made with the Pressed Steel Car Company for the sale of the trucks, bolsters, brake-beams and steel car lines made by that company. The Monarch Company will also manufacture, one of the things to be made being the Daly railroad spike. This is expected to be ready for the market about March 1. The temporary office of the company is at 614-618 Majestic Building.

Rear Admiral Walker, Chairman of the Isthmian Canal Commission, Washington, D. C., is sending out specifications for machinery and miscellaneous supplies, including steam hammers, lathes, planers, universal milling machines, car wheel boring machines, driving wheel presses, double bolt cutters, four spindle nut tappers, bolt headers, pipe threading machines, emery grinders, twist drill grinders, 51 in. boring mill, air compressor and automatic railroad cut-off saw. A large quantity of files, wrenches, pipe reamers, pipe taps, drill chucks, lathe chucks and vises are also required, as well as leather belting of various widths, globe and brass angle valves, pulleys, rail cars, push cars, etc. Bids for all these materials must be in by 10:30 a.m. February 7.

Iron and Steel.

The Donora furnace of the Union Steel Co. is now turning out iron and a second stack will soon be put in operation.

At the Carnegie Steel Co.'s works a series of accidents to its furnaces has kept one or more, especially in the Edgar Thomson group, out of blast.

The Pennsylvania, reports say, has given an order for 2,600 tons of structural steel to be used in building the union station in Washington, and the Norfolk & Western one for 1,800 tons of steel for bridges.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 24.)

Canadian Society of Civil Engineers.

At the meeting of the mechanical section of this society in Montreal, January 9, a paper on "Locomotive Crossheads" was read by W. F. Drysdale.

Engineers' Club of St. Louis.

At the regular meeting of this club January 18, a paper on "Recent Terminal Improvements in St. Louis" was presented by Daniel Breck, Chief Engineer of the Ter-

minal Railway Association. A. P. Greensfelder, Assistant Engineer, described some details of reconstruction work.

Central Railway Club.

At the annual meeting of this club in Buffalo, January 13, the following officers were elected: President, C. H. Hogan (N. Y. C.), Buffalo; First Vice-President, F. W. Williams (D., L. & W.), Buffalo; Second Vice-President, John Miller (International Traction), Buffalo; Third Vice-President, E. T. James (L. V.), Sayre, Pa.; Executive Committee, James MacBeth (N. Y. C.), East Buffalo; H. N. Butts (N. Y. C.), Albany, and E. P. Mooney, Buffalo. Harry D. Vought continues as Secretary and Treasurer, and George W. Jennings, of Buffalo, is Chairman of the Entertainment Committee. The present membership of the club is 332.

PERSONAL.

—Mr. James M. Gruber, who on Wednesday of next week becomes General Manager of the Chicago, Burlington & Quincy to succeed Mr. Delano, is a native of Iowa, having been born in Iowa City 37 years ago. Mr. Gruber began railroad service at the age of 17 as a stenographer and clerk in the general office of the St. Paul, Minneapolis & Manitoba. For three years from 1886, he held a similar position in the General Manager's office. In 1889 he resigned and went to the Atchison, Topeka & Santa Fe, but soon went to the Montana Central as General Superintendent. In March, 1897, he was appointed Assistant General Superintendent of the Great Northern's Eastern District. From there he went to the Chicago, Rock Island & Pacific as General Superintendent, and early in 1904 he went to the

Union Pacific as General Superintendent, which position he now leaves to go to the Burlington.

—Mr. H. A. Barr, who has retired from the general agency of the Chicago & North Western at Escanaba, Mich., after a service of 41 years, was, on the evening of January 11, the guest of a large number of his associates at a dinner at the New Ludington Hotel, in that town; and the expressions of esteem and friendship which are to be found in the reports of the after-dinner speches indicate that Mr. Barr's circle of friends must include every one who knows him. Letters filled with good wishes were read from President Marvin Hughitt and from Messrs. McCullough, Cantillon, Aishton, and other officers of the road. Mr. Barr retires on a pension, under the pension regulation of the company now in force. During his incumbency of the Escanaba office the ore shipments from that port have increased from a very small beginning to an enormous annual aggregate. When he began he delivered ore into vessels carrying 400 tons each, while now 10,000 tons is a not unusual cargo.

—Mr. P. C. Stohr, Assistant Traffic Director of the Union Pacific and allied lines at Chicago, was educated in the public schools and entered railroad service at the age of 17. His first railroad work was as a clerk on the Chicago, Rock Island & Pacific. In 1882 he was appointed contracting freight

agent for the Chicago & North Western in New York. Five years later he became General Eastern Agent in that city for the Minnesota & North Western. In 1889 he went to Chicago, where he was General Freight Agent of the Chicago, St. Paul & Kansas City, and continued in that office for the successor company, the Chicago Great Western. In 1899 he was appointed General Traffic Manager, which position he now resigns to become Assistant Traffic Director of the "Harriman Lines."

—Mr. W. W. Williams, one of the engineers who built the St. Joseph & Grand Island, and Superintendent of that road from 1888 to 1894, died at St. Joseph, Mo., last week.

—Mr. William Sellers, head of the firm of William Sellers & Company, machine builders, of Philadelphia, died in that city on Tuesday last at the age of 80. Mr. Sellers was one of the most noted iron manufacturers of the country, and while President of the Franklin Institute, to which office he was first elected in 1864, he proposed the formula for the system of screw threads which has become the standard for the United States, and has made his name a household word among machinists and mechanics everywhere. Mr. Sellers was born in Upper Darby, Pa., Sept. 19, 1824, and was apprenticed to his uncle in a machine shop at the age of 14. On becoming of age he went to Providence, R. I., to take charge of a steam engine shop. Two years later he returned to West Philadelphia and established a similar business on his own account, subsequently taking a partner. This partnership, Bancroft & Sellers, lasted until the death of Mr. Bancroft in 1855, and after that the name of the firm was William Sellers & Company. In 1868 Mr. Sellers established the Edgemoor Iron Company and five years later was chosen President of the Midvale Steel Company at Nicetown, Philadelphia. The Edgemoor Company made all the iron for the buildings of the Centennial Exhibition in 1876 and for the Brooklyn Bridge. Mr. Sellers was President of the Centennial Board of Finance and was one of the chief workers in the establishment of that great enterprise. His firm had received innumerable prizes and medals for excellent machine tools, and at Vienna, in 1873, it received a grand diploma. Mr. Sellers had important business interests in many directions and was for several years a director in the Philadelphia & Reading Railroad, and also in the Philadelphia, Wilmington & Baltimore. He was a trustee of the University of Pennsylvania and a member of the National Academy of Sciences. He is survived by his widow, one daughter and three sons.

—Mr. L. B. Sullivan, General Freight and Passenger Agent of the Mobile, Jackson & Kansas City, died recently, following injuries received in a wreck which occurred on that road at a point a few miles south of Beaumont, Miss. Mr. Sullivan was riding in the engine of a passenger train when it ran into a washout and was overturned. Mr. Sullivan had been with the Mobile, Jackson & Kansas City for a number of years, and had previousiy been on the Louisville & Nashville.

—Mr. F. H. Bainbridge, the new Principal Assistant Engineer of the Chicago & North Western, is a graduate of Rensselaer Polytechnic Institute, class of 1884. Shortly after graduation he went to work for Messrs. Buck & McNulty, Civil Engineers. He next entered the service of the Northern Pacific as inspector of shops and then for seven years (from 1886) was draftsman at the Edge Moor Bridge Works, Wilmington, Del. In 1893 he became Resident Engineer of the Pencoyd Iron Works and the Mt. Vernon Bridge Company at Chicago. Two years later he was appointed Engineer of the Buffalo & Niagara Falls Electric Railway. Then for a time he was in charge of the office of

Alfred Noble, Civil Engineer. He worked for a time for contractors on the Illinois Central, and for the Atchison, Topeka & Santa Fe. In 1898 he resigned to go to the Chicago & North Western in charge of construction. In 1902 he was Engineer for the Western Expanded Metal Company. In April, 1903, he went to the Illinois Central as Assistant Engineer of Bridges. In June, 1904, Mr. Bainbridge was promoted to be Engineer of Bridges.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—R. J. Arey has been appointed Resident Engineer at Williams, Ariz.; M. B. Terrass at Los Angeles, Cal., and E. F. Henderson at Oakland, Cal.

Atlantic Coast Line.—J. T. King has

been appointed Car Accountant, succeeding E. E. Gardner, Acting Accountant.

Baltimore & Ohio.—J. B. Cameron, Division Engineer at Newcastle, Pa., has resigned to go to the Alaska Central.

Boston & Maine.—J. W. Marden, heretofore General Foreman car department, has been appointed Assistant Master Car Builder, with headquarters at Boston.

Chicago & North Western.—P. J. O'Brien has been appointed Superintendent of the Northern Wisconsin division; W. F. Walker, Trainmaster of the Northern Iowa division; W. E. Morse, Superintendent of the Madison division; M. J. Gormley, Trainmaster of the Minnesota division.

Chicago, Burlington & Quincy.—John Fifer has been appointed Master Mechanic of the new Des Moines division, which includes the lines from Des Moines to Albia, Des Moines to Gainesville, Mo., and from Tracey to Burlington through Oskaloosa.

Chicago, Indiana & Eastern.—David Anderson, hertofore Foreman of Shops on the Lake Erie & Western, has been appointed Superintendent of Equipment.

Illinois Central.—R. E. Gaut, heretofore Assistant Engineer of Bridges, has been appointed Engineer of Bridges, succeeding F. H. Bainbridge, resigned. H. H. Hadsall has been appointed Assistant Engineer of Bridges.

Lehigh Valley.—F. L. Blendinger has been appointed Purchasing Agent and Superintendent of Telegraph, with office at 228 South Third Street, Philadelphia, and 143 Liberty Street, New York. Mr. Blendinger has also been appointed Purchasing Agent of the Lehigh Valley Coal Co.

Louisiana & Northwest.—G. R. Wansbrough has been appointed General Freight and Passenger Agent, with headquarters at Gibsland, La.

Southern Railway.—The office of Signal Engineer has been abolished. C. P. Adams, Superintendent of Telegraph, now has charge of all interlocking plants and signals, and the Electrical Engineer reports to him.

LOCOMOTIVE BUILDING.

The Duluth, Missabe & Northern is reported to have ordered six locomotives.

The Norfolk & Western is reported to have ordered 30 locomotives from the Baldwin Works.

The Duluth & Iron Range is reported to have ordered five locomotives from the Baldwin Works.

The Chicago, Rock Island & Pacific is reported to have ordered 20 locomotives from the Richmond Works of the American Locomotive Co.

The Temiskaming & Northern Ontario has ordered four locomotives from the Canadian Locomotive Co., of Kingston, Ont., the lowest bidder for the order.

The Norfolk & Western has ordered 18 consolidation (2-8-0) freight locomotives, nine from the Baldwin Works and nine from the American Locomotive Co.

The Bangor & Aroostook is reported to have ordered four 10-wheel (4-6-0) freight locomotives and two 3-wheel (0-6-0) switchers from the Manchester Works of the American Locomotive Co.

The Chicago, Rock Island & Pacific has reserved space with the American Locomotive Co. for 30 freight and passenger and 20 switching locomotives, and is now having built the 65 locomotives, for which space was reserved last July.

The Erie has ordered 50 simple consolidation locomotives from the Schenectady Works of the American Locomotive Co., instead of 25, as reported in our issue of January 20. These locomotives will weigh 202,000 lbs., with 179,000 lbs. on drivers; cylinders, 22 x 32 in.; diameter of drivers, 62 in.; straight top boiler, with a working steam pressure of 200 lbs.; heating surface, 3,230 sq. ft.; 372 charcoal iron tubes 2 in. in diameter and 15 ft. 10 in. long; Otis steel wide fire-box 104⅛ in. x 75¼ in.; grate area, 54 sq. ft.; tank capacity, 7,000 gallons, and coal capacity, 14 tons.

The Wisconsin Central, as reported in our issue of January 13, has ordered five simple Atlantic-type passenger and several simple consolidation freight locomotoves from the Rogers Locomotive Works. The Atlantic-type locomotives will weigh 160,000 lbs., with 88,000 lbs. on drivers; cylinders 20 in. x 26 in.; diameter of drivers, 79 in.; radial stayed wagon-top boiler, with a working steam pressure of 200 lbs.; heating surface, 2,654 sq. ft.; 306 tubes, 2 in. in diameter and 15 ft. 5¾ in. long; fire-box, 96 in. x 74 in.; grate area, 49 sq. ft.; tank capacity, 5,000 gallons, and coal capacity, 12 tons. The consolidation locomotives will weigh 160,000 lbs., with 139,000 lbs. on drivers; cylinders, 21 in. x 26 in.; diameter of drivers, 63 in.; radial stayed wagon-top boiler, with a working steam pressure of 200 lbs.; heating surface, 2,445 sq. ft.; 306 tubes, 2 in. in diameter and 15 ft. long; fire-box, 108 in. x 63 in.; grate area, 46 sq. ft.; tank capacity, 6,000 gallons, and coal capacity, 12 tons.

The Delaware & Hudson is building five simple 10-wheel (4-6-0) locomotives at its Green Island shops. These locomotives will weigh 173,000 lbs., with 130,000 lbs. on drivers; cylinders, 21 x 26 in.; diameter of drivers, 63 in.; Wooten boiler, with a working steam pressure of 200 lbs.; total heating surface, 2,663.7 sq. ft.; 308 National charcoal iron tubes 2 in. in diameter and 15 ft. long; fire-box, 119⅞ x 102 in., made by the Carbon Steel Co.; grate area, 84½ sq. ft.; tank capacity, 7,000 gallons, and coal capacity, 12 tons. The special equipment includes: New York air-brakes, Cambria Steel (Coffin process) axles, Sansom bell ringers, Magnesia sectional boiler lagging, Simplex brake-beams, Diamont "S" brake-shoes, Janney cast-steel couplers, Dressel headlights, Hancock composite injectors, United States metallic piston and valve rod packings, Consolidated safety valves, Leach sanding devices, Nathan sight-feed lubricators, Railway Steel-Spring Co.'s springs, Ashcroft steam gages, Consolidated and Economy steam heating equipment, Taylor cast-steel tender wheels, and on two of the locomotives, Young-type cylinders.

CAR BUILDING.

The East Louisiana has ordered six passenger cars from Barney & Smith.

The Boston & Maine has ordered 20 passenger cars from the Pullman Co.

The Buffalo & Susquehanna has ordered 12 passenger cars from Barney & Smith.

The St. Louis & San Francisco has ordered 50 cabooses from the American Car & Foundry Co.

The Wabash System is reported to have ordered 2,500 steel frame gondolas of 100,000 lbs. capacity.

The Pennsylvania Lines West have ordered five passenger cars from the American Car & Foundry Co.

The El Paso & Southwestern has ordered one café parlor car from the Pullman Co., for February delivery.

The W. J. Rainey Coal Company, of Connellsville, Pa., will build 600 steel coal cars at its Mt. Braddock shops.

The Chicago, Burlington & Quincy will build three mail cars at its own shops. These cars will be 60 ft. long and 9 ft. 8 in. wide.

The Louisville & Nashville is reported to have begun building 200 40-ft. refrigerator cars of 100,000 lbs. capacity, to be completed May 1.

The Norfolk & Western is reported to have ordered 1,000 steel coal cars, 500 box cars, 10 passenger coaches and 11 combination coaches.

The New York, Ontario & Western has ordered eight coaches from the Harlan & Hollingsworth Co., of Wilmington, Del., for May delivery.

The New York, New Haven & Hartford has ordered the 115 cars for passenger service referred to in our issue of Jan. 6, 55 from the Bradley Car Works and 60 from the Wason Car Mfg. Co.

The Cleveland, Cincinnati, Chicago & St. Louis is reported to have ordered four 14-section sleepers, each to contain a drawing room and state room, but no smoking compartment, from the Pullman Co.

The Southern has ordered 750 plain box cars from the Western Steel Car & Foundry Co., and 750 ventilated box cars from the Mt. Vernon Car Manufacturing Co. It is also reported to have ordered 500 gondolas from the American Car & Foundry Co.

The Chicago & Eastern Illinois has ordered 1,000 box cars of 60,000 lbs. capacity from the American Car & Foundry Co., for February, March and April delivery. These cars will be 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, all inside measurements.

The Erie, as reported in our issue of January 20, has ordered 1,000 box cars of 80,000 lbs. capacity from the American Car & Foundry Co. These cars will weigh 40,500 lbs. and measure 36 ft. long, 8 ft. 6 in. wide and 8 ft. high, all inside measurements.

The Grand Trunk, as reported in our issue of December 23, has ordered 1,000 freight cars from the Mt. Vernon Car Manufacturing Co. These are box cars of 60,000 lbs. capacity for the Central Vermont Railway for March 20, 1905, delivery.

The Southern, as reported in our issue of January 20, has ordered 20 60-ft. baggage and express cars from the American Car & Foundry Co. The special equipment includes: Diamond special brake-beams, Westinghouse air-brakes, Southern R. R. standard brasses, Janney couplers, Miner tandem draft rigging, Harrison dust guards, McCord journal boxes and lids, Pintsch light, American Car & Foundry Co.'s platforms, Buhoup vestibules and Paige wheels.

The Dominion Coal Company has ordered 150 steel hopper-bottom gondolas of 100,000 lbs. capacity from the Pressed Steel Car Co. These cars are to be 29 ft. 7½ in. long inside, 31 ft. 1¼ in. long over end sills, 9 ft. 6 in. wide inside and 10 ft. high from top of rail. The special equipment includes: Pressed Steel body bolsters, Monarch couplers, twin-spring draft rigging, Pressed Steel truck bolsters, brake-beams and diamond truck frames, gray iron journal boxes with Pressed Steel box lids and 33-in. cast-iron wheels.

The Chicago & Alton, as reported in our issue of January 20, has ordered 200 steel hopper-bottom coal cars of 100,000 lbs. capacity from the Pressed Steel Car Co. for May delivery. These cars will be 30 ft. ¼ in. long and 9 ft. 6 in. wide inside and will average 5 ft. 9¼ in. high. The special equipment includes: Simplex bolsters, Damascus brake-beams, Christie brake-shoes, New York air-brakes, Climax couplers, Miner draft rigging, National malleable castings, Chicago & Alton journal boxes and lids and arch-bar type trucks.

The Chicago & North Western, as reported in our issue of January 6, has ordered 1,000 box cars of 80,000 lbs. capacity from the Pullman Co., for May, June and July delivery. These cars will be 36 ft. long, 9 ft. ¾ in. wide and 13 ft. 4½ in. high. The special equipment will include: Williamson & Priese bolsters, brake-beams, draft rigging and trucks; Congdon brake-shoes, Westinghouse air-brakes, Chicago couplers, Chicago & North Western standard door fastenings, doors, dust guards and journal box lids; and Hutchins plastic roofs.

The Chicago, Rock Island & Pacific, as reported in our issue of January 13, has ordered 10 chair cars and 10 coaches from the Pullman Co. These cars will be 70 ft. 10 in. long, over sills. The special equipment will include: Pullman steel axles, American Steel Foundries double cast steel bolsters, National-Hollow brake-beams, Christie brake-shoes, New York air-brakes, Janney couplers, Forsyth curtain fixtures, Pantasote curtain materials, Pullman Standard door fastenings, Waugh draft rigging, Pullman double coil and Safety steam heating system, Symington journal boxes and lids, Pintsch gas and Consolidated electric axle system lighting, Standard Steel platforms, Pullman standard roofs, Hale & Kilburn seats, Pullman trucks and vestibules and National wheels.

The Nashville, Chattanooga & St. Louis, as reported in our issue of January 20, has ordered six passenger cars from the Pullman Co. for April delivery. These cars will weigh 80,000 lbs., and will measure 60 ft. long, 9 ft. 8 in. wide and 14 ft. 2¼ in. high over lamp jacks. The special equipment includes: Pullman axles, bolsters, brake-shoes, brasses, journal boxes, paint and wide vestibules; National-Hollow brake-beams, Westinghouse air-brakes, National couplers, Forsyth curtain fixtures, Pantasote curtain material, Nashville, Chattanooga & St. Louis standard draft rigging, Baker heating system, Fletcher journal box lids, Pintsch light, Standard Steel platforms, Pittsburg Spring & Steel Co.'s springs and Paige steel-tired wheels.

The St. Joseph & Grand Island, as reported in our issue of January 13, has ordered two combined mail and baggage cars from the St. Louis Car Co. for March delivery. These cars will have wooden frames and underframes and will weigh 97,000 lbs. They will be 70 ft. long, inside measurement, 30 ft. of which will be for mail and 40 ft. for baggage. The special equipment includes: Hammered iron axles, American steel-body double bolsters, Kewanee brake-beams, Westinghouse air-brakes, Spiral brasses, Janney couplers, Safety straight steam-heating system, St. Joseph & Grand Island standard journal boxes, Fletcher journal box lids, Commercial acetylene lighting system, Pullman standard paint, canvas roofs, standard springs, St. Joseph & Grand Island standard 6-wheel trucks and Paige 36-in. steel tired wheels.

BRIDGE BUILDING.

ALPENA, MICH.—A concrete bridge is proposed over the Thunder Bay river near this city, to cost about $12,000; also a steel bridge over the same river in Green township.

ARKANSAS.—The United States Senate has passed the bill authorizing the building of a bridge over the Ouachita river in Arkansas.

CINCINNATI, OHIO.—The Cincinnati, Georgetown & Portsmouth will spend between $15,000 and $20,000 for bridges on the line of its road during this year.

County Engineer Frank Krug is reported having estimated the cost of building an electrical lift bridge over the canal at Benton Street, Lockland, at $24,814, and is making plans and specifications.

CLEVELAND, OHIO.—City Engineer Carter is said to be working on plans for a high level bridge 115 ft. high over the Cuyahoga river to cost in the neighborhood of $2,000,000, and to be built either at Huron street or Lake street.

CULPEPER, VA.—Bids, it is reported, are wanted February 20 by A. F. Brown, County Commissioner, for putting up a steel bridge 224 ft. long over the Rapidan river between Culpeper and Spottsylvana counties.

DES MOINES, IOWA.—Plans have been submitted to the City Engineer for a Melan arch over the Des Moines river.

GREENSBURG, PA.—The Jeannette, West Newton & Monongahela Street Railway Co., it is reported, will put up a steel bridge 600 ft. long over Big Sewickley Creek.

INDIANAPOLIS, IND.—The County Commissioners, it is reported, are asking bids (February 7) for building the new bridge over White river at River avenue. (January 20, p. 22.)

IONIA, MICH.—At a recent special election, it was voted to authorize the building of a new bridge over the river, to cost $25,000.

LAFAYETTE, IND.—According to local reports, the Cleveland, Cincinnati, Chicago & St. Louis will build a new bridge over the Wabash river in the southern part of the city.

LAWTON, OKLA. T.—The Interior Department has given a contract to the Virginia Bridge & Iron Co. for about 15 steel bridges to be put up in Comanche County ranging in price from $600 to $2,000. Plans are being made by the U. S. Agricultural Survey for building 20 additional steel bridges in this county at a cost of about $20,000.

LOUISVILLE, KY.—The Louisville & Nashville, it is reported, has given a contract for putting up 32 new steel bridges on the Kentucky Central division of that road, which will in future be known as the Cincinnati-Atlanta division.

NEW BEDFORD, MASS.—Hearings are to be given on January 28 to representatives of the various towns which are to bear a share of the cost of building the new $1,000,000 bridge over Acushnet river between Fairhaven and New Bedford.

NEW ORLEANS, LA.—The Missouri Valley Bridge & Iron Co., of Leavenworth, Kan., is about to begin work on four bridges, two of which will be of the lift type, over the various basins on the route of the Belt Line, for which it has a contract at about $100,000.

PORT CLINTON, OHIO.—Bids, it is reported, are wanted February 17 by the County Commissioners for the superstructure of a steel bridge 225 ft. long, with a 16-ft. roadway, over Portage river, in Harris township. Henry Pafenbach is County Auditor.

PROVIDENCE, R. I.—A resolution has been introduced in the City Council authorizing the building of an additional bridge over the Woonasquatucket river at Harrison avenue.

SALINA, N. Y.—A contract has been given by the state to the King Bridge Co., of Cleveland, Ohio, at about $20,000 for putting up a single-span steel bridge over the Seneca river at Cold Spring, connecting this town with Lysander.

SHARPSBURG, PA.—The Baltimore & Ohio, it is reported, has decided to rebuild four bridges of the Pittsburg & Western over Pine Creek between this place and Bakerstown at a cost of about $84,000.

TORONTO, ONT.—Plans have been approved by the Railway Commission for building nine steel bridges on the line of the Toronto & James Bay Railway.

WESTMORELAND, KAN.—Bids are wanted January 31 by the Board of County Commissioners for four steel bridges in Pottawatomie County. C. A. Grutzmacher is County Clerk.

YORK, NEB.—Bids are wanted February 20 by C. C. Bolslaw, County Clerk, for building all the bridges that may be needed for one year in York County.

Other Structures.

BROOKLYN, N. Y.—The Long Island, it is reported, has commenced work on a large new freight house at Atlantic, Fifth and Vanderbilt avenues. The site for this building cost about $500,000.

CHARLESTON, S. C.—According to local reports, land has been bought for a site for the new union passenger station at the corner of Columbus and Bay streets, on which work is soon to be commenced.

GOMEZ, DURANGO, MEX.—The Mexican Central is planning to put up a new roundhouse and a small repair shop and to make extensive improvements to its yards.

MONROE, N. C.—According to local reports, the Seaboard Air Line will spend about $75,000 at this place for yard improvements, a coal chute and a passenger station, and eventually may put up some shop buildings.

NEWARK, N. J.—The Central of New Jersey is having John W. Ferguson, a contractor and builder of New York, draw plans for a six-story brick and stone storage warehouse to occupy the entire block bounded by the Central's tracks, Lawrence, Mechanic and Ward streets, to cost about $500,000. Construction will begin early in the spring.

PORT ARTHUR, ONT.—Plans, it is reported, have been made by the Canadian Pacific for putting up a new passenger station, on which work is to be begun early next spring.

SHREVEPORT, LA.—Negotiations have been resumed between the Vicksburg, Shreveport & Pacific, the Texas & Pacific, and the St. Louis Southwestern looking to the erection of a union passenger station here.

SPENCER, N. C.—The Southern, according to local reports, has decided to put up a large store and office building adjoining the new shops.

TAMPA, FLA.—According to local reports, the Seaboard Air Line is planning to put up a new passenger station to cost about $25,000.

VICTORIA, B. C.—According to reports from Montreal, the Canadian Pacific will put up a hotel at Victoria, to cost about $500,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALBUQUERQUE EASTERN (SANTA FE CENTRAL).—It is reported that this company has begun building from Moriarty, N. Mex., on the Santa Fe Central, to Albuquerque, 46 miles. The following companies are stated to be controlled by the same interests as the Albuquerque Eastern and the Santa Fé Central: Durango, Albuquerque & Gulf, incorporated in New Mexico on December 7 with $6,000,000 authorized capital stock to build a 200-mile line extending from near Algodones, on the Atchison, Topeka & Santa Fe, through Sandoval, Bernalillo, McKinley, Rio Arriba and San Juan counties, N. Mex., and La Plata County, Col.; Colorado, New Mexico & Gulf, incorporated in Colorado on December 14 with $500,000 authorized capital stock to build from Durango, Col., to a connection with the Durango, Albuquerque & Gulf at the New Mexico state line; Torrance, Roswell & Gulf, incorporated in New Mexico on December 31 with $2,500,000 authorized capital stock, to build from Torrance, connecting with the Santa Fe Central, to Roswell, on the Pecos Valley & Northeastern. The directors of these companies include: Francis J. Torrance, of Pittsburg, Pa.; T. Lee Clark, of Allegheny, Pa., and W. H. Andrews, of Albuquerque, N. Mex.

ALGOMA CENTRAL & HUDSON BAY.—Of the 220 miles of this proposed road, 87 have been completed and 108 are graded, leaving a balance to be built of about 25 miles.

ARIZONA & CALIFORNIA (A., T. & S. F.).—Twelve miles of track have been laid on this road out of Wickenburg, Ariz. The road is to run from Wickenburg, on the Santa Fe, Prescott & Phoenix, west to Bengal, Cal., on the Atchison, Topeka & Santa Fe, Coast Lines. W. A. Drake, Prescott, Ariz., is Chief Engineer.

ATHABASCA RAILWAY & OIL COMPANY.—Application will be made to the Dominion Government to incorporate this company with power to build from Edmonton, Alberta, northeasterly to the Athabasca River near the Clearwater River, 250 miles.

ATLANTIC & BIRMINGHAM.—It is reported that this road, which runs from Waycross, Ga., to Montezuma, Ala., and from Bruns-

wick to Thomasville, will be immediately extended from Montezuma to Birmingham, Ala. The route has been surveyed. George D. Wadley, Waycross, Ga., is Vice-President and General Manager. (See Construction Supplement.)

BALTIMORE & OHIO.—It is reported in local newspapers that the company intends to build a branch from Fairmont, W. Va., northeast via Catawba and Morgantown, W. Va., to Confluence, Pa., 50 miles.

BIG HORN RAILROAD (C., B. & Q.).—Articles of incorporation have been filed in Wyoming by this company, which proposes to build a railroad from Frannie or Garland, on the Chicago, Burlington & Quincy, in Big Horn County, south through Big Horn and Fremont counties to a point in the Big Horn Valley in Fremont County, near the junction of the Big Horn River and Muskrat Creek.

CENTRAL INDIANA TRACTION.—This company, which proposes to build an interurban line from Peru, Ind., to South Bend, paralleling the Lake Erie & Western from Peru to Plymouth, has been incorporated in Indiana with a capital stock of $25,000. James O. Cole, of Peru, is President.

CHICAGO & NORTH WESTERN.—This company has made a survey from Casper, Wyo., to Lander and Thermopolis, and has obtained rights of way across the Wind River reservation to Lander; and it is reported that a branch will be built from the main line at Orin Junction to Lander. (November 18, p. 160.)

COLORADO & SOUTHERN.—It is reported that this company will extend its line from Fort Collins, Col., northeast to Cheyenne, Wyo., 40 miles, and its Wyoming branch from Orin Junction, Wyo., west to Casper, 70 miles. The latter extension would parallel the Chicago & Northwestern's Wyoming line.

CORNING, KEUKA LAKE & ONTARIO.—This road has been incorporated to build from Corning, N. Y., north to Lake Ontario, 96 miles. This is a revival of the Sodus Bay, Corning & New York, organized long ago, but killed by litigation which lasted more than 30 years. Thirty-five miles of the roadbed was graded by the former company. The new company is capitalized at $1,500,000. Among the directors are R. H. Curtis and J. E. Zimmerman, of Bradford, N. Y.

DES MOINES, IOWA FALLS & NORTHERN.—Officers are quoted in denial of the report that the road has been leased by the Missouri Pacific. (January 13, p. 15.)

GREAT NORTHERN.—The branch from Lakota, N. Dak., to Edmore has been extended from Edmore, Ramsey County, to Munich.

The Columbia Falls cut-off from Columbia Falls west to Jennings, Mont., has been finished. This was built to shorten the line, reduce grades and curvature.

It is reported that surveys are being made for a line from Rugby, N. Dak., to Balfour, on the Minneapolis, St. Paul & Sault Ste. Marie, and from there southwesterly to coal lands.

GUTHRIE RAILWAY (ELECTRIC).—This company has been granted a charter in Oklahoma Territory to build a line from Edmond north to Guthrie, 20 miles. The capital stock is $600,000, and among the incorporators are L. N. Beedles, J. R. Cottingham, and George M. Green, of Guthrie and Oklahoma City.

HALIFAX & SOUTHWESTERN.—This line is open for traffic for 140 miles southwest of Halifax, Nova Scotia. The first train ran through from Halifax to Liverpool on January 16. The remainder of the line to Yarmouth, 60 miles, will probably be opened early in the summer. (See Construction Supplement.)

ILLINOIS, IOWA & MINNESOTA.—It is reported that this road, which is now in operation from Aurora, Ill., northwest to DeKalb, 28 miles, has let a contract for an extension from DeKalb northwest to Rockford, 25 miles, and that work is now in progress on this extension between DeKalb and Kirkland, 10 miles. I. W. Troxel, Aurora, Ill., is Chief Engineer. (November 11, p. 153.)

INTERSTATE (VIRGINIA).—This company, which operates a line between Stonega and Appalachia, six miles, and a branch from Mud Lick to Rhoda, three miles, is planning an extension from Appalachia, where it connects with the Virginia & Southwestern and the Louisville & Nashville, through Rockwood and up Roaring Fork to Kelleyview, 15 miles.

IOWA & GREAT NORTHERN.—This company is reported incorporated with a capital stock of $500,000 to build a connection, at a place not mentioned, between the Burlington and the Great Northern.

JAMESTOWN & YOSEMITE VALLEY.—This road has been incorporated in California with a capital of $1,000,000 to build a line from Jamestown southeast to a point at or near Maricopa, 40 miles; also an intermediate branch 35 miles long extending into the Yosemite Valley. T. S. Bullock, S. D. Freshman and others, of San Jose, Cal., are the incorporators.

LAKE ERIE & PITTSBURG.—The President of this company is reported to have announced the route of the proposed line as follows: From Lorain southeast to Olmsted Falls, and from Olmsted Falls through Berea northeast to a point within the city limits of Cleveland, from which a branch will be built to connect with the Newburg & South Shore. From Berea the line will be built east across the Cuyahoga River near Hudson and via Streetsboro, Freedom, Newton Falls, Niles and Girard to Youngstown and Lowellville.

MARION COUNTY.—This company has been incorporated in Arkansas to build a road from Yellville east to the mouth of Buffalo River, 25 miles, where a connection can be made with the Iron Mountain, and it is stated that work will shortly be begun. J. C. Smith, Thomas Combs and J. E. Williams, of Little Rock, are among the directors.

MEDFORD & CRATER LAKE.—This road has been incorporated in Oregon with a capital stock of $500,000, to build from Medford, on the Southern Pacific, east to Crater Lake, 30 miles

MEADVALE & SOMERVILLE.—This road is reported to have been built for a distance of 10 miles from Strange Creek, W. Va.; and it is to be extended 10 miles further.

MEXICAN ROADS.—José H. Hampson, of the city of Mexico, has been granted a concession for building a road from Rancho del Guarda to Canada de Nepancpa, in the Federal District.

MINNEAPOLIS & ST. LOUIS.—It is reported that the Des Moines & Fort Dodge is to be rebuilt. Wooden bridges will be replaced by steel, new rails will be laid and the ballast renewed.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—It is reported that McIntosh Bros. & Evans, of Milwaukee, have been given the contract for building 45 miles of the extension of this road from Ladysmith, Wis., to Owen, near Withee, 45 miles.

MISSOURI, OKLAHOMA & GULF.—It is reported that this road will build 375 miles of road, mostly in Indian Territory, early in 1905.

MISSOURI RIVER & NORTHWESTERN.—This company, which is the Dakota Pacific reorganized, is building a 30-mile line from Rapid City to Mystic, S. Dak., 8 miles of which is reported to be completed.

MISSOURI ROADS.—A contract is said to have been given to the Ware Construction Co. to build a line from Lamar, Mo., northwest through Barton County to Jerico and Stockton, the county seat of Cedar County.

MONTEVISTA & NORTHEASTERN.—This company has been incorporated in Colorado with a capital stock of $500,000 to build a railroad from Montevista, Rio Grande County, through Costilla, Saguache, Custa and Huerfano counties to Pueblo; also to build from Montevista through Rio Grande, Conejas, Archuleta and La Plata counties to Durango, N. M. Among the incorporators are Charles S. Fassitt and George W. Gates, of Montevista; W. W. Riley and C. H. Redmond, of Denver.

MOOSE JAW & EDMONTON.—This company will apply to the Dominion Government for authority to build from Moose Jaw, Assiniboia, northwest to Edmonton, Alberta, 425 miles. Both places are on the Canadian Pacific, but the line between them is roundabout.

NATIONAL OF MEXICO.—It is reported that this road will build a branch to El Cuguas, in the state of Vera Cruz, where oil fields owned by the Oil Fields of Mexico, Ltd., are situated.

The branch from Monterey east to San Miguel, 120 miles, was opened on January 1. At San Miguel this branch connects with the road from San Miguel to Matamoras, near the mouth of the Rio Grande, which was formerly isolated from the rest of the system. It is expected that connection will be made by ferry at San Miguel with the St. Louis, Brownsville & Mexico.

NEW YORK, NEW HAVEN & HARTFORD.—Contractors are invited to bid on the work of four-tracking and on the other improvements of the Harlem River branch, the cost of which is estimated at about $5,000,000. (July 29, p. 47.)

The directors have authorized the double tracking of the Highland division from Towners, N. Y., to Danbury, Conn., 16 miles. The Highland division has already been double tracked from Hopewell Junction to Towners, 19 miles. (October 7, p. 119.)

NUECES VALLEY, RIO GRANDE & MEXICO.—This company has been incorporated in Texas with a capital stock of $300,000 to build a road from Aransas Pass westerly to Del Rio, on the Rio Grande, 300 miles. M. C. Wells and E. E. Churchill, of Austin, Tex., are among the incorporators.

OKLAHOMA & NORTHWESTERN.—Col. C. G. Jones, the President of this company, is reported as saying that work will be begun at once on the line from Coalgate, Ind. T., northwest to Carmen, Okla. T., 140 miles. (See Construction Supplement.)

OMAHA, DECATUR & NORTHERN.—It is reported that a contract for grading 16 miles of this road between Tekamah, Neb., and Decatur has been let to Clifford C. Pierce and L. F. Wakefield, of Sioux City, Iowa, and that work will shortly be begun.

OREGON & EUREKA.—An officer writes that track has been laid on 2½ miles of the extension of eight miles from Eureka to Arcata, and that the work will be completed this year. The work is being done by the company.

OREGON RAILROAD & NAVIGATION.—An officer denies the report that a branch is to be built by this road from Tekoa, Wash., east to the Coeur d'Alene reservation.

ST. LOUIS NORTHEASTERN.—This road has been incorporated in Illinois with a capital stock of $400,000 to build from East St. Louis northeast to Hillsboro, on the Cleveland, Cincinnati, Chicago & St. Louis, 50 miles. W. B. McKinley and B. R. Stevens are among the incorporators.

SAN FRANCISCO & NAPA.—Track is reported laid on six miles of this road, which is being built as an extension of the California Northwestern from near McGill, Cal., to Napa, 12 miles.

SHARON RAILWAY (ERIE).—This company has been incorporated to build a branch of the Erie Railroad from Newcastle, Lawrence County, Pa., north to Pymatoon, Marshall County, 22 miles. Hon. E. A. Wheeler, of Sharon, Pa., is President.

SOUTHERN.—This company is reported to be surveying a line between Marion, N. C., and Johnson City, Tenn., which would make possible a short line between the Virginia coal fields and the Atlantic Coast at Charleston.

SPOKANE INTERNATIONAL.—This company is reported to have filed articles of incorpo-

ration in the state of Washington asking authority to build from Spokane to the international boundary, where the proposed road will connect with a branch to be built by the Canadian Pacific, with which company a 50-year traffic agreement is reported to have been made. D. G. Corbin, of Spokane; Chester W. Chapin and J. K. O. Sherwood, of New York, are among the incorporators.

SPRINGFIELD & NORTHWESTERN (ELECTRIC).—The stockholders of this company have voted to issue $750,000 in bonds, of which $600,000 will be used for building the road between Springfield, Ill., and Lincoln, 30 miles, and $150,000 for a power house at Lincoln. Grading is now completed for three-quarters of the distance between Springfield and Lincoln, and it is expected that track will be laid in the early spring.

TALLULAH FALLS.—It is reported that this company, whose road runs from Cornelia, Ga., through Turnerville and Tallulah Falls to Clayton, has let a contract for an extension from the latter point to Franklin, N. C., 24 miles, where connection can be made with a projected branch of the Southern from Knoxville, Tenn. George L. Prentiss, of New York, is President. (October 14, p. 125.)

TEXAS & GULF.—This company, which recently acquired by purchase the Texas, Sabine Valley & Northwestern, and the Marshall, Timpson & Sabine Pass, which together make a line from Longview, Tex., to Timpson, 60 miles, is reported to be building from Timpson south, 40 miles. G. M. D. Grigsby, of Longview, Tex., is President.

TOLEDO, MARSHALL & NORTHERN.—This company has filed a $4,000,000 mortgage for 50 years at 5 per cent. in favor of the Knickerbocker Trust Company of New York, the money from which is to be used in building a road from Bay City, Mich., southwest to Montpelier, Ohio, 150 miles, using the old roadbed of the Marshall & Coldwater road, which has been graded for a number of years.

TRINITY & BRAZOS VALLEY (ROCK ISLAND). This company, whose road at present runs from Cleburne, Tex., via Hillsboro to Mexia, is planning to extend the line during this year about 300 miles into Southeastern Texas, probably to Beaumont and Houston. (See Construction Supplement.)

VANCOUVER, WESTMINSTER & YUKON.—The President of this company, which is controlled by the Hill interests, is reported as saying that a line will be built from North Vancouver through Le Clover, to connect with the Grand Trunk Pacific and Canadian Northern in the northern part of British Columbia.

VINITA & NORTHWESTERN.—Surveys are being made for this road which is projected from Vinita, Ind. T., north to Timber Hill and northwest to Coffeyville, Kan., a total of about 70 miles. R. A. McClellan is interested.

WADLEY & MT. VERNON EXTENSION.—The directors of this road, which now is completed from Barraw Bluff, Ga., south to Nashville, Berrien County, Ga., 56 miles, have voted to change the name of the company to the Douglas, Augusta & Gulf. The extension from Nashville south to the Okmulgee river will be finished and application will be made for a charter to build through to the Gulf.

WOODSTOCK & LAKE HURON.—The Dominion Parliament is being asked to authorize the construction of a railroad from Woodstock, Ont., northwest to a point on Lake Huron near Kincardine.

RAILROAD CORPORATION NEWS.

ATCHISON, TOPEKA & SANTA FE.—The stockholders have approved the proposed issue of $50,000,000 convertible bonds and $50,000,000 increase of common stock to provide for the conversion requirements of the bond issue. None of the stock will be sold.

CHESAPEAKE & OHIO.—This company is reported to have bought the Quinnimont Short Line, a coal road running from Quinnimont, W. Va., to Beckley, 10 miles. The price paid for the road and rolling stock is said to have been $100,000.

COLORADO SPRINGS & CRIPPLE CREEK DISTRICT.—It is reported that a controlling interest in this road has been sold to B. F. Yoakum, of the Colorado & Southern. The road runs from Colorado Springs to Cripple Creek, 46 miles, with a branch from Cameron to Victor, six miles, and owns electric lines connecting important points in the Cripple Creek mining district. The road has $800,000 preferred and $1,200,000 common stock. Of the first consolidated 5 per cent. mortgage bonds of 1902, $2,977,000 were reserved to retire $1,977,000 first and $1,000,000 second-mortgage bonds. Of the second-mortgage bonds, $756,000 had been retired in June, 1904.

COLUMBUS, GROVE CITY & SOUTHERN (ELECTRIC).—This company, which is one of the Appleyard system of electric lines in Ohio, has been placed in the hands of J. G. Schmidlap and Myron Wilson, the receivers for other Appleyard lines.

CONSOLIDATED RAILWAY (N. Y., N. H. & H.).—This company has asked the legislature of Connecticut to give to it all rights which belong to its constituent companies under their respective charters.

DAYTON & WESTERN (ELECTRIC).—Through service has been established over this road between Dayton, Ohio, and Indianapolis, Ind., via Richmond. The run is scheduled to be made in 4 hours and 55 minutes.

ILLINOIS CENTRAL.—On declaring the regular semi-annual dividend of 3 per cent. payable March 1, the Board of Directors "resolved that, in recognition of the fact that the company has to-day declared its one-hundredth semi-annual cash dividend and in commemoration thereof, there be made to the stockholders an extra distribution of ½ per cent. payable simultaneously with the semi-annual dividend just declared."

MINNEAPOLIS & ST. LOUIS.—A contract has been made with the Chicago, Burlington & Quincy by which the trains of this company and the Iowa Central will use the Burlington tracks between Des Moines, Iowa, and Oskaloosa, about 60 miles. The Iowa Central line between Peoria, Ill., and Oskaloosa will thus be virtually extended westward to Des Moines.

MISSOURI, KANSAS & TEXAS.—The November statement of this road shows that gross earnings increased 19 per cent. over last year, net increased 19 per cent., and the surplus increased 37 per cent. For the five months ending November 30, gross earnings increased 14 per cent.; net earnings, 25 per cent., and the surplus, 62 per cent. The surplus earned in the 12 months ending Nov. 30, 1904, was the largest on record, amounting to over $1,500,000.

NEW YORK & OTTAWA RAILWAY.—This company has been incorporated at Albany with $1,250,000 authorized capital stock as successor to the New York & Ottawa Railroad, recently purchased at a foreclosure sale by the New York Central & Hudson River. The incorporators are: John Carstensen, W. K. Vanderbilt and J. P. Morgan.

NEW YORK CENTRAL & HUDSON RIVER.—This company has bought a majority of the capital stock of the Rutland Railroad, and also of the St. Lawrence & Adirondack. The last-named is already a part of the New York Central system, being that part of its Adirondack division from Malone, N. Y., to Valleyfield, Que., 65 miles; but the Rutland constitutes an addition of 415 miles. The lines of the Rutland extend from Bellows Falls, Vt., northward to Rutland, Burlington and Rouses Point, and thence westward to Ogdensburg, 279 miles; from Rutland southward to Bennington, 60 miles, and thence southward to Chatham, N. Y., 57 miles farther, with branches to White Creek, Vt., Ticonderoga, N. Y., and Noyan Junction, Que. The capital of the Rutland consists of $199,400 common stock, $9,057,600 preferred and $12,129,000 bonds. The St. Lawrence & Adirondack has $1,615,000 stock and $1,279,844 bonds. The ownership of both lines has been controlled heretofore by Dr. W. Seward Webb, whose interests are closely affiliated with those of the Vanderbilts.

NORTHERN PACIFIC.—In addition to the quarterly dividend of 1½ per cent. recently declared by the directors an extra dividend of ¼ per cent. was declared.

PITTSBURG, SHAWMUT & NORTHERN.—A merger of the Pittsburg, Shawmut & Northern and the Shawmut Connecting railroads has been filed in New York State.

RIO GRANDE WESTERN.—N. W. Harris & Co., of New York and Chicago, are offering at 93 and accrued interest $500,000 Rio Grande Western first consolidated mortgage 4s.

SANDUSKY SOUTHWESTERN (ELECTRIC).—The engineer appointed by the court to examine the properties of this company, now in the hands of a receiver, reports that the company owns on the main line from Wapakoneta to Kenton 22.35 miles of right of way, 20.80 of which have been graded, and in addition, 17.57 miles of right of way on branch lines, 2.86 of which have been graded. The company also owns franchises in Wapakoneta, Kenton, Waynesville and Roundhead.

SCHENECTADY RAILWAY (ELECTRIC).—It is reported that New York Central and Delaware & Hudson interests have bought a controlling interest in this company, which owns 55.78 miles of main track in and about Schenectady, N. Y. This purchase, with the trolley lines already owned, gives the New York Central control of all the important electric lines between Syracuse and Albany.

UTICA & MOHAWK VALLEY ELECTRIC (NEW YORK CENTRAL).—N. W. Harris & Co., New York and Chicago, offer at 104 and interest $350,000 first and refunding mortgage 4½ per cent. gold bonds dated Sept. 1, 1901, and due Sept. 1, 1941. The company, which operates 104 miles of electric railway in Utica and the Mohawk Valley, is controlled in the interest of the New York Central & Hudson River through the ownership of a majority of its capital stock. Of these bonds, $2,268,000 have already been issued.

WABASH.—It is reported that the interests in control of this road have bought large tracts of coal lands in West Virginia; and have acquired control of the Rocky Ridge Railroad, which connects with the coal tracts.

WASHINGTON, BALTIMORE & ANNAPOLIS TRACTION.—This company is a consolidation of the electric lines recently bought by the Bishop-Sherwin syndicate, of Cleveland. It is stated that its capital will be $4,000,000, and the bonded indebtedness the same; of which $3,000,000 will be first-mortgage 4½ per cent. 30-year gold bonds and $1,000,000 will be second-mortgage 4½ per cent. 25-year gold bonds. The capital of the old Washington, Baltimore & Annapolis was $2,000,000, of which $1,400,000 is outstanding, and the funded debt, $2,000,000 is 5 per cent. 20-year gold bonds with $1,200,000 outstanding. This company owned the Washington, Berwyn & Laurel Traction Co., which has a capital stock of $500,000 and $222,000 5 per cent. gold bonds. The Washington, Berwyn & Laurel, which runs from Berwyn northeast to Laurel, Md., 10 miles, had a perpetual franchise, and a 25-year contract with the city lines of Washington, D. C. The old company also owned the Annapolis, Baltimore & Washington steam railroad. The lines of the proposed system, when completed, will run from Baltimore to Washington and from Annapolis, via Annapolis Junction, Laurel and Berwyn to Washington.